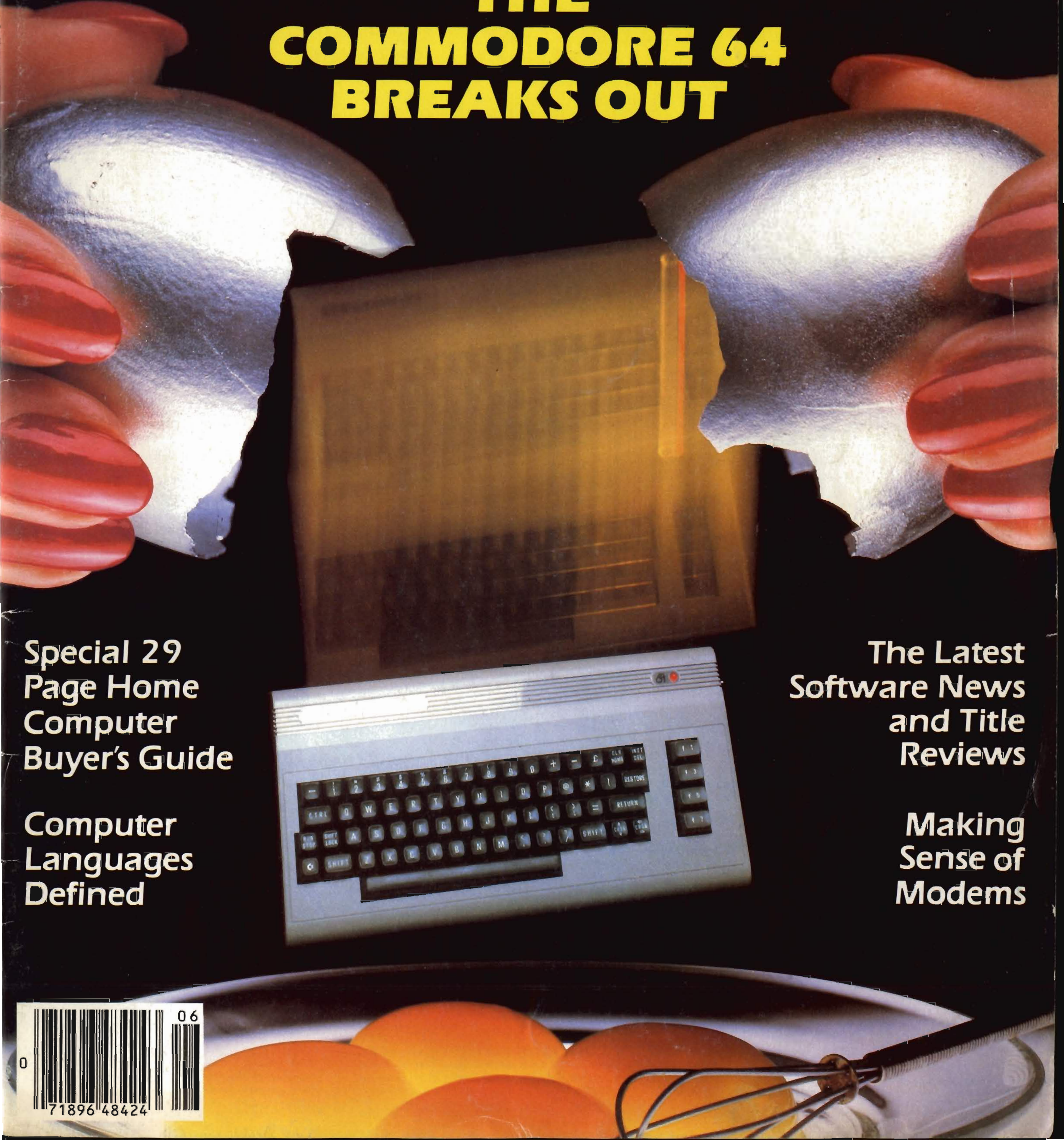
EASY HOME COMPUTER™

PREMIERE ISSUE
K48424
June 1983 U.S. $2.50 Canada $2.95

THE COMMODORE 64 BREAKS OUT



Special 29 Page Home Computer Buyer's Guide

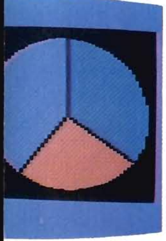
Computer Languages Defined

The Latest Software News and Title Reviews

Making Sense of Modems

06
0 71896 48424

IF YOU OWN A COMMODORE VIC YOU KNOW IT CAN DO ALL THIS.



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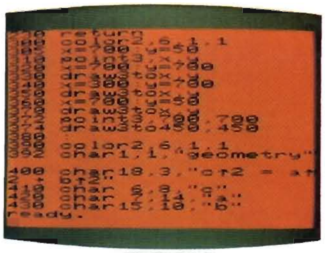
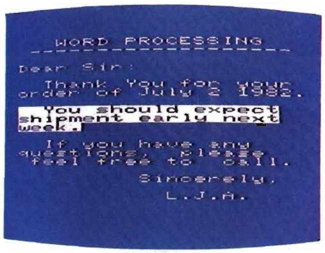
NDAR**

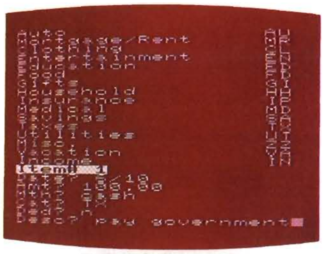


BASIC PROGRAMMING



```
   WORD PROCESSING
 ____________________
Dear Sir:
  Thank You for your
order of July 2 1982.
  You should expect
shipment early next
week.
  If you have any
questions, please
 feel free to  call.
          Sincerely,
            L.J.A.
```

WORD PROCESSING



```
Auto
Mortgage/Rent
Clothing
Entertainment
Education
Food
Gifts
Household
Insurance
Medical
Savings
Taxes
Utilities
Misc
Vacation
Income
Item# 1
Date? 6/10
Amt?  100.00
Mthd? cash
Ded?  TX
Desc? n
Desc? Pay government
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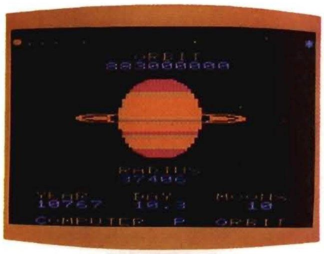
PERSONAL FINANCE

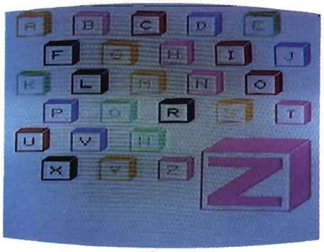


VISIBLE SOLAR SYSTEM

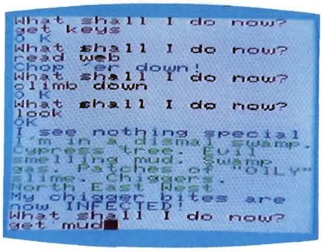
**PING
TOR**

POINTS 00 SCORE 000
40÷5=

BINGO/ SPEED MATH

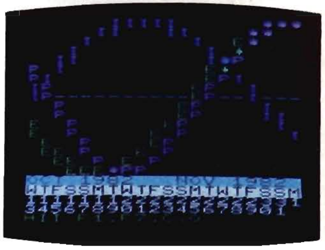


HOME BABY SITTER

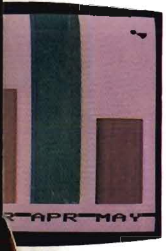


```
What shall I do now?
get keys
O K
What shall I do now?
read web
Chop 'er down!
What shall I do now?
climb down
O K
What shall I do now?
look
OK
I see nothing special
I'm in a dismal swamp.
Cypress tree. Evil
smelling mud. Swamp
gas. Patches of "OILY"
slime. Chiggers.
North East West
My chigger bites are
now INFECTED!
What shall I do now?
get mud
```

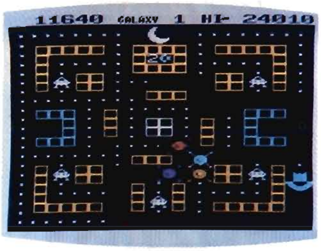
ADVENTURE LAND



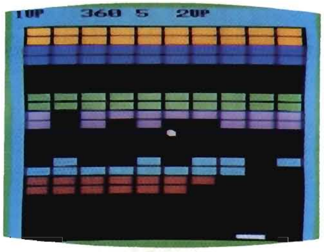
BIORHYTHMS



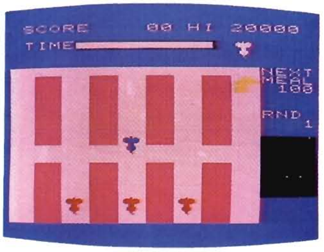
**ME
TORY**



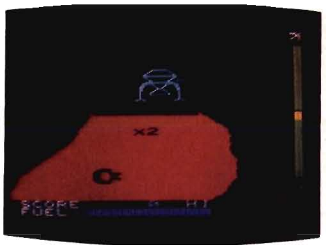
COSMIC CRUNCHER



SUPER SMASH



RADAR RAT RACE

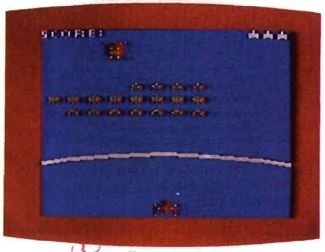


JUPITER LANDER

**ER
EN**

CHESS

VIC AVENGER



GORF

OMEGA RACE

What those extra few dollars get you is a simple little device called a Commodore VICMODEM.

It connects your telephone to your VIC 20™ or Commodore 64™ computer (resulting in something aptly called telecomputing), giving you access to information such as you see on the screens to your right.

Normally, you'd have to type a short program into your computer to help it make the final transition into a telecomputer.

However, when you buy a VICMODEM, you'll find we've included a free software program. You just load it into your Commodore Datassette Recorder, and presto (give or take a moment or two), you have access to a vast library of information and games.

Speaking of free, Commodore also includes a free subscription and a free hour's time on CompuServe™ and Dow Jones News/Retrieval Service,® a free trial offer on The Source,℠ and a discount program offer with Comp-U-Store and General Videotex Corp.

Let's see. Did we leave anything out? Oh, yes. Along with CompuServe comes a free membership in the Commodore Information Network. This is your HOTLINE to Commodore. (How often do you get to speak directly to a manufacturer?) Through it we

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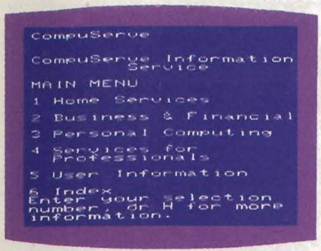
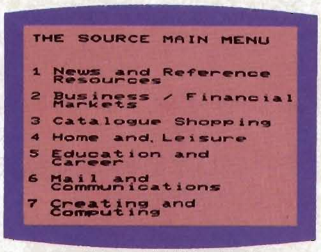
BUT DID YOU KNOW FOR ABOUT $100 YOU CAN ALSO GET IT TO DO ALL THIS?



```
CompuServe

CompuServe Information
          Service
MAIN MENU
1 Home Services
2 Business & Financial
3 Personal Computing
4 Services for
  Professionals
5 User Information
6 Index
Enter your selection
number, or H for more
information.
```

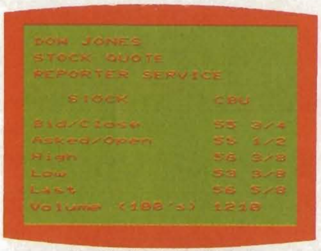
COMPU SERVE™



```
THE SOURCE MAIN MENU

1 News and Reference
  Resources
2 Business / Financial
  Markets
3 Catalogue Shopping
4 Home and, Leisure
5 Education and
  Career
6 Mail and
  Communications
7 Creating and
  Computing
```

THE SOURCE℠



```
DOW JONES
STOCK QUOTE
REPORTER SERVICE

   STOCK           CBU

Bid/Close          55 3/4
Asked/Open         55 1/2
High               56 3/8
Low                53 3/8
Last               56 5/8
Volume (100's)    1210
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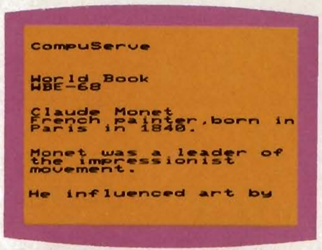
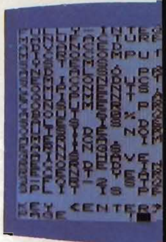


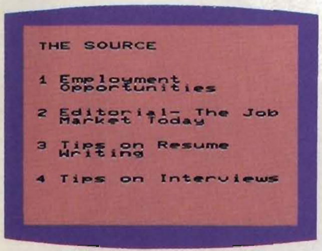
```
CompuServe

World Book
WBE-68

Claude Monet
French painter,born in
Paris in 1840.

Monet was a leader of
the impressionist
movement.

He influenced art by
```

WORLD BOOK ENCYCLOPEDIA



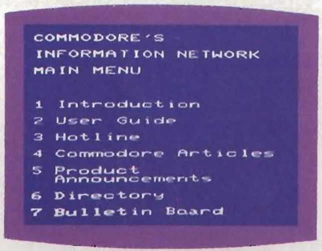
```
KEY <ENTER>
PAGE
```

STOCK



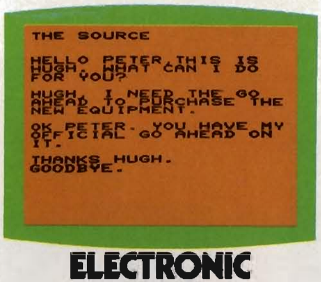
```
THE SOURCE

1 Employment
  Opportunities

2 Editorial- The Job
  Market Today

3 Tips on Resume
  Writing

4 Tips on Interviews
```

EMPLOYMENT OPPORTUNITIES



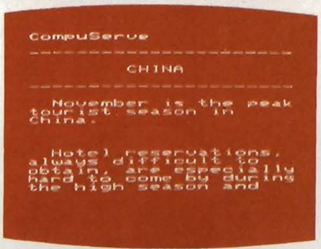
```
COMMODORE'S
INFORMATION NETWORK
MAIN MENU

1 Introduction
2 User Guide
3 Hotline
4 Commodore Articles
5 Product
  Announcements
6 Directory
7 Bulletin Board
```

COMMODORE INFO. NETWORK



```
THE SOURCE

HELLO PETER,THIS IS
HUGH. WHAT CAN I DO
FOR YOU?

HUGH, I NEED THE GO
AHEAD TO PURCHASE THE
NEW EQUIPMENT.

OK PETER. YOU HAVE MY
OFFICIAL GO AHEAD ON
IT.

THANKS HUGH.
GOODBYE.
```

ELECTRONIC MAIL

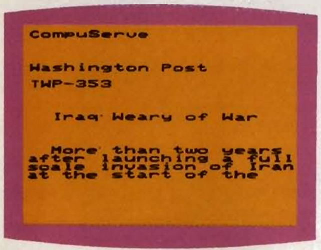


```
CompuServe
---------------------------
          CHINA
---------------------------
  November is the peak
tourist season in
China.

  Hotel reservations,
always difficult to
obtain, are especially
hard to come by during
the high season and
```

TRAVEL INFORMATION

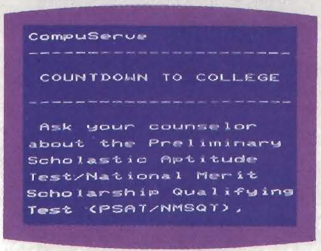
```
CompuServe

   GAMES
  ENTERTA

1   Adventur
2   Blackjac
3   Civil  W
4   Eliza
5   Fantasy
6   Faster M
7   Bridge
```

MORE



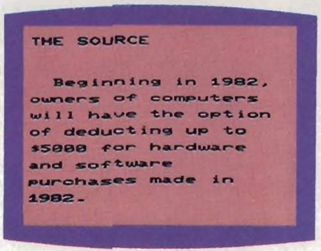
```
CompuServe

Washington Post
TWP-353

   Iraq Weary of War

  More than two years
after launching a full
scale invasion of Iran
at the start of the
```

WIRE SERVICE NEWS



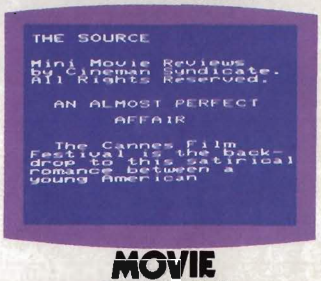
```
CompuServe
---------------------------
 COUNTDOWN TO COLLEGE
---------------------------
 Ask your counselor
about the Preliminary
Scholastic Aptitude
Test/National Merit
Scholarship Qualifying
Test (PSAT/NMSQT).
```

COLLEGE PLANNING



```
THE SOURCE

  Beginning in 1982,
owners of computers
will have the option
of deducting up to
$5000 for hardware
and software
purchases made in
1982.
```

TAX ADVICE

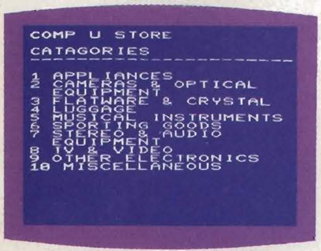


```
THE SOURCE

Mini Movie Reviews
by Cineman Syndicate.
All Rights Reserved.

   AN ALMOST PERFECT
        AFFAIR

  The Cannes Film
Festival is the back-
drop to this satirical
romance between a
young American
```

MOVIE REVIEWS

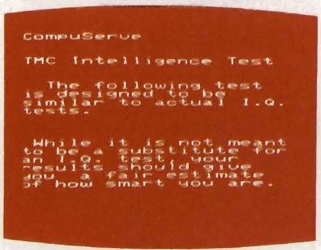
```
COMPUSERVE
PAGE CIS-1

COMPUSERVE
INFORMATION

1 HOME SERV
2 BUSINESS
  FINANCIAL
3 PERSONAL
4 SERVICES
  PROFESSIONAL

5 USER INFO
6 INDEX

ENTER YOUR
NUMBER,
OR H FOR MO
INFORMATION
```

ACCESS
COMP



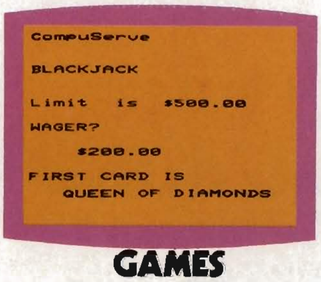
```
COMP U STORE
CATAGORIES
-------------------------
1  APPLIANCES
2  CAMERAS & OPTICAL
   EQUIPMENT
3  FLATWARE & CRYSTAL
4  LUGGAGE
5  MUSICAL INSTRUMENTS
6  SPORTING GOODS
7  STEREO & AUDIO
   EQUIPMENT
8  TV & VIDEO
9  OTHER ELECTRONICS
10 MISCELLANEOUS
```

SHOP AT HOME



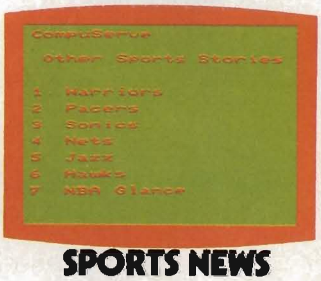
```
CompuServe

TMC Intelligence Test

  The following test
is designed to be
similar to actual I.Q.
tests.

  While it is not meant
to be a substitute for
an I.Q. test, your
results should give
you a fair estimate
of how smart you are.
```

I.Q. TESTS



```
CompuServe

BLACKJACK

Limit  is  $500.00

WAGER?

    $200.00

FIRST CARD IS
   QUEEN OF DIAMONDS
```

GAMES



```
CompuServe

 Other Sports Stories

1   Warriors
2   Pacers
3   Sonics
4   Nets
5   Jazz
6   Hawks
7   NBA Glance
```

SPORTS NEWS

```
PROFIT
 < $1,00
ACCT.      JAN
Revenue:
Sales
Cost
Diff.
Net
Expenses:
Salary
Commis.
```

BUSINES

can answer any questions you might have about your computer, or programming, or anything else Commodore-related, via electronic mail.

The Commodore Information Network is also your direct line to the Commodore Bulletin Board, which Commodore owners use to keep in touch with each other, for programming tips, Public Domain Software, and technical support.

THE COMMODORE VIC 20, A REAL COMPUTER FOR THE PRICE OF A TOY.

Altogether, these little extras we've included with our VICMODEM add up to a value of $197.50. A nice return on an investment of around $100.

Some computer companies think it's reasonable to ask as much as $500 for telecomputing capabilities such as ours.

However, with the Commodore VICMODEM selling for around $100, we feel we're being a whole lot more reasonable. Don't you agree?

commodore COMPUTER

These are just a few examples from our existing library of software available for the VIC 20.
U.S.A.–P.O. Box 500, Conshohocken, PA 19428; Canada–3370 Pharmacy Avenue, Ontario, Canada M1W 2K4.

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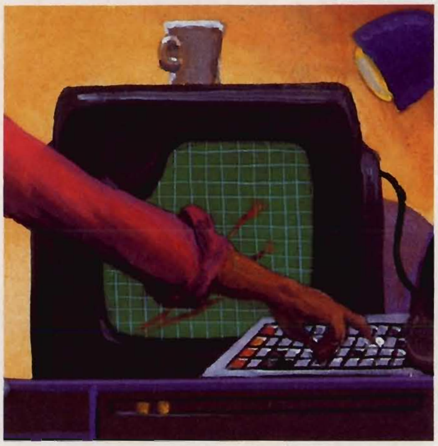

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R12,0
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Coming to Terms With Computers

Cover Photography Gene Coleman

Be Sly.

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FOX

friendly
professional
word processing

Catch the Quick Brown Fox.

Quick Brown Fox word processing software has more features than WordStar and runs on your standard VIC or Commodore 64. Plus you can easily expand your system by adding memory, 80 column display, disks and even a letter quality printer. Let the Quick Brown Fox show you how for $65. Get our free brochure.

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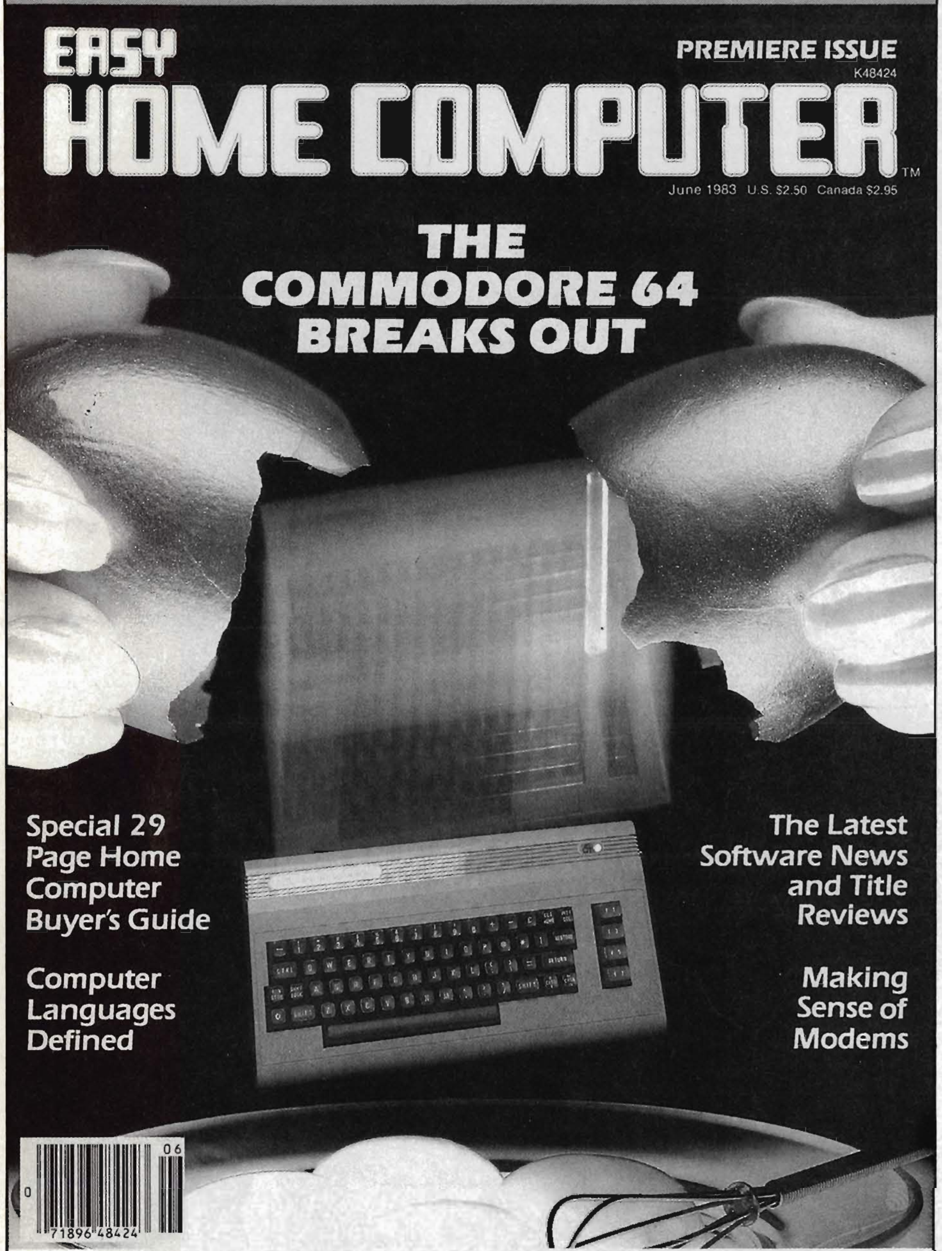
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Computer Languages Defined
The Latest Software News and Title Reviews
Making Sense of Modems
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ON LINE

With all the attention and hype directed at the rapid emergence of the personal home computer as the next technological wonder, it seemed disheartening that no ongoing publication existed that concentrated on the basics. After all, the brave new world we're now entering isn't without its own unique characteristics, none of which we've experienced before. As a result, there's a certain amount of trepidation, as well as intimidation, which many of us bring to this intermeshing of man and machine.

We may acknowledge its importance in the never-ending quest to create inventions that simplify life and improve its quality, but the hesitancy to embrace new developments with open arms, can often be due to the fact that we don't totally understand them and lack a viable resource to turn to for insight. Enter EASY HOME COMPUTER, a magazine designed to inform, educate, and familiarize you with the capabilities and applications of home computers in daily life.

Our intent is to be your reference guide in discovering the whys and wherefores. Taking you along every step of the way, EHC wants to make you comfortable with the entire prospect of what it will mean to live in a computer-based society and how this will effect each of us. Every issue will explore the latest breaking news and developments to keep you abreast of the events as they happen. And EHC's style won't take anything for granted. In fact, you'll find that *Easy Home Computer* will not only cover the basics but will make available to you a wealth of other—more sophisticated information in an easy-to-read and enjoyable format.

Although there seems to be more emphasis lately on software programs such as games, in this, our premiere issue, we've attempted to be methodical in our approach to the subject matter. So we start with the systems you'll need in order to be able to play at all. Beginning on page 35 is EHC's Special Computer Buyer's Guide, as a way to introduce you to over two-dozen different personal home computers—from standard desktop models to a sampling of the most popular portables and even the newest breed of hand-helds. But don't think that we've ignored the softer side. On page 28 you'll find information and overviews of some of the most recent programs available.

To further aid your understanding of computers, EHC brings you "Speak Easy" on page 64. This in-depth feature focuses on the many different computer languages that are now being used—those that you should know, others that might become more important dialects to master—and the how-tos of surviving with regular, old-fashioned English. And for something out of the ordinary, we bring you a special piece of fiction about the present and the future—a game called "Pluto's Defense" and someone named Frederick (page 72). Plus, EHC gives you a direct connection to the telecommunications' world of modems, some computerized graphics sights well worth casting an eye on, and much more.

We hope to make EHC your single most important computer-age investment. Enjoy, and welcome to the beginning of Easy Home Computer magazine. ●

Roger C Mayer

THE LEMON™ SOURS SURGES

The LEMON™
AC Surge Protector
LN
GR

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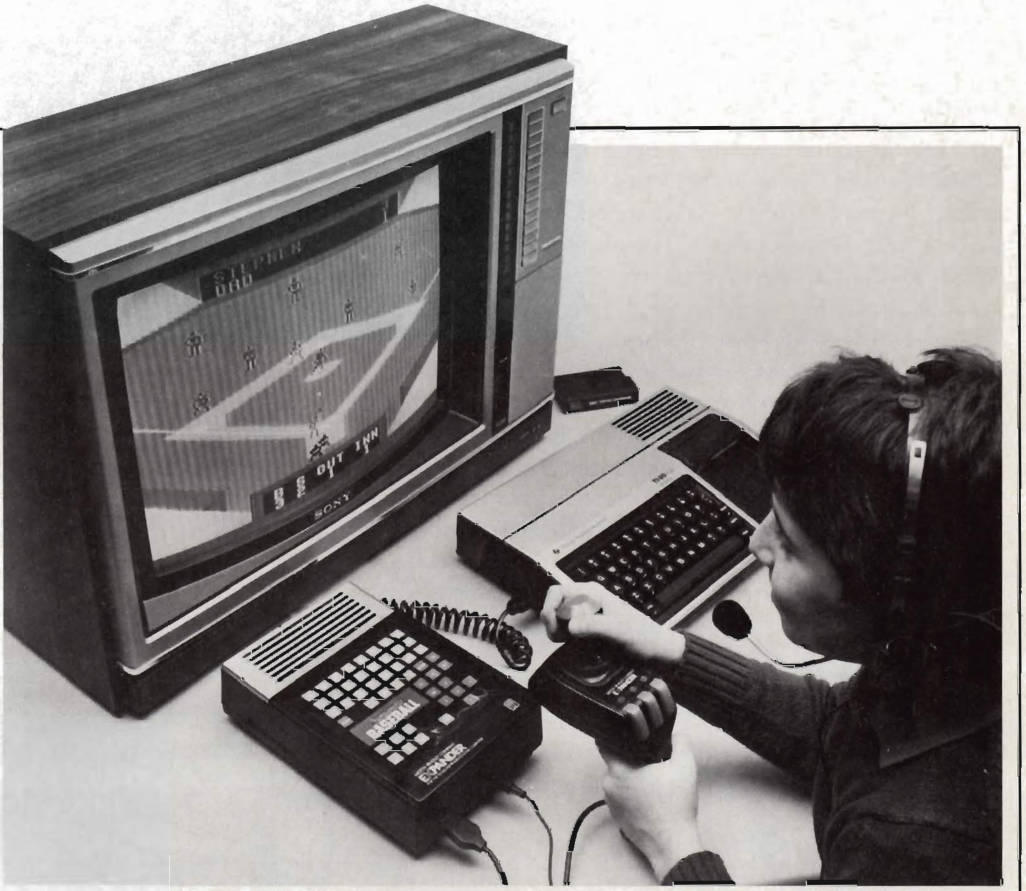
SMALL BYTES

By Samantha Evans

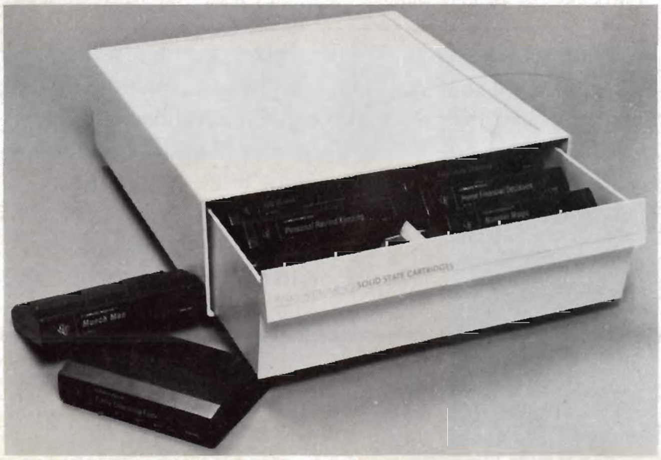
AURAL GRATIFICATION

Now hear this: For the first time, human voice recognition plus voice synthesis are possible in a home computer via Milton Bradley's **Expander** (about $90) and its complimentary software line. The plug-in peripheral, designed for compatibility with Texas Instruments' TI-99/4A, features a 64-position key pad with overlays for each cartridge, three-axis joystick and headset/microphone for commands. The game of "Show and Tell" is finally entering the computer age.



TOP DRAWERS

An out-of-sight way to store TI-99/4A cartridges and cassettes is in Texas Instruments' heavy molded-plastic software cabinets (about $15). Each holding twelve packages in sliding drawers, the stackable units provide high-tech cover for your hidden assets.



FULL CIRCLE

With the same recording capacity as the double-density mini floppy disk now widely used as external memory for office and personal computers, Maxell's newly introduced 3-inch **Compact Floppy Disk** (CFD; about $10) is destined to run rings around its 8- and 5¼-inch predecessors. Rotation speed, data transfer rate, recording capacity per track and other specifications are all identical to those of the 5¼-incher; plus, material can be transmitted from one to the other. Packaged with an industry-unusual lifetime warranty, the CFD, believes Maxell vice-president for sales and marketing of special products Ted Ozawa, "will eventually lead to the era of the portable computer."

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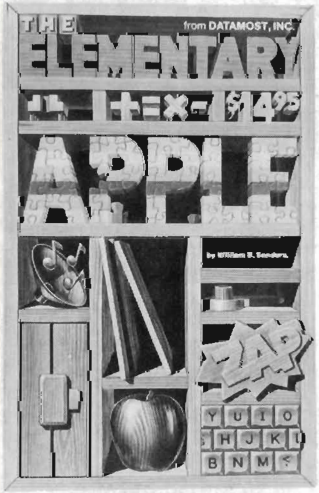
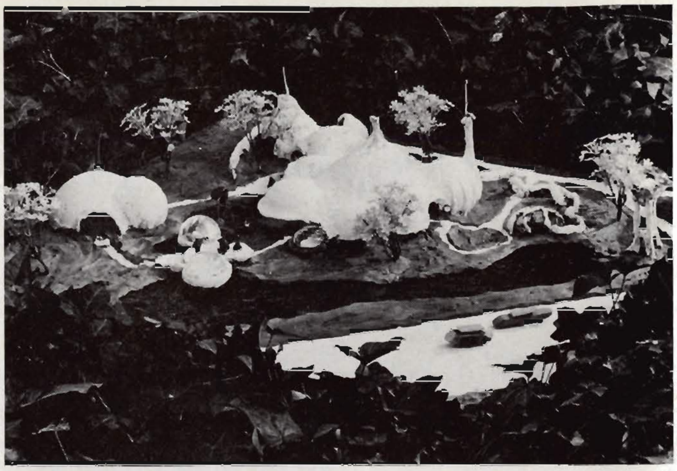
BITING INTO THE APPLE

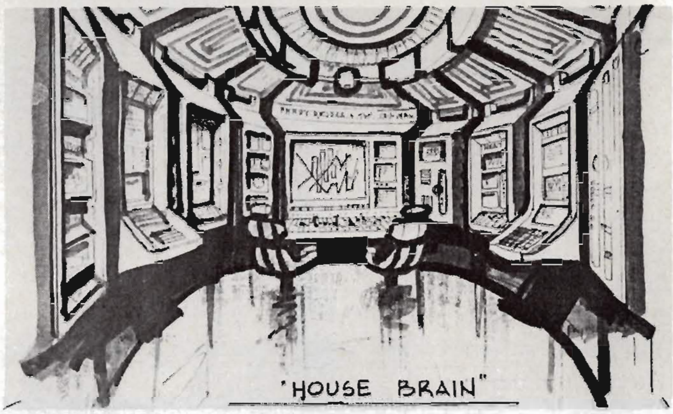
"The Elementary Apple" (Datamost, 8943 Fullbright Avenue, Chatsworth, Calif. 91311, 213-709-1202; $14.95), a ten-chapter technical guide, tells the beginner everything he needs to know to get to the core of his computer. Written in easy-to-understand language by William B. Sanders and lavishly illustrated by cartoonist Martin Cannon, the book comprehensively covers introductory topics from hooking up peripherals to writing successful programs, with additional information of value even to experienced users. Non-Apple owners might instead pick **"The Elementary Commodore"** or **"The Elementary Timex/Sinclair"** ($14.95 each), also on line by Sanders from Datamost.

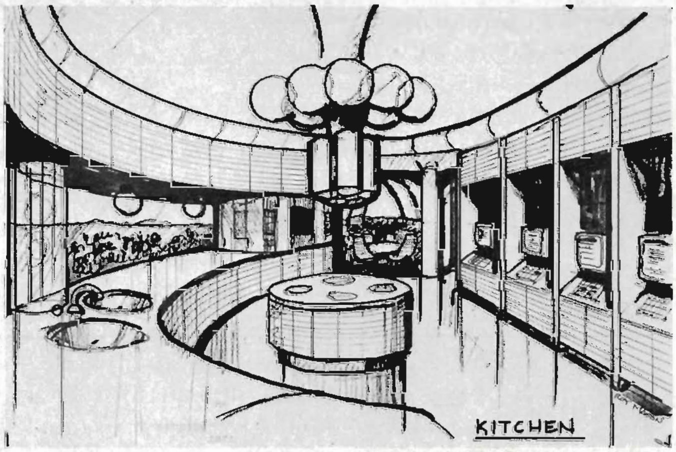


HOME INSTINCTS

Electronic paradise found is the theme of architect Roy Mason's **Xanadu,** a demonstration home soon to open in Orlando, Florida, near Disneyworld and Epcot. The architecture editor of Futurist magazine and president of the Architronics Divison of Integrated Communication Technology, Mason believes that "the house of tomorrow will be our second skin, working in symbiosis with its inhabitants. The home computer will become a 'house brain,' monitoring energy, security and lights and assisting in preparing and serving meals by 'robutler,' while its biofeedback sensors will anticipate our needs, providing computer-generated art and music and alerting us to important information. Families will gather around an 'electronic hearth' to watch the videotex news and satellite-delivered movies, play the latest computer games and share gossip with friends via computerized communication networks." At "Jetson"-reminiscent Xanadu, installations by a number of major consumer electronics firms will anticipate tomorrow's every whim today. Incidentally, Mason is currently designing the first "intelligent" office building in Houston, to prove that, come the future, the computer's place will be elsewhere besides the kitchen.







ADD-ON ATTRACTION

Reprogramming your favorite video game system for more sophisticated home computing is a snap with the easily installed **Entex 2000 Piggy Back** (Entex Industries, Inc., 303 West Artesia Boulevard, P.O. Box 8005, Compton, Calif. 90220, 213-637-6174; about $130). The standard keyboard with nine special-function plus four cursor keys, built-in 8K BASIC program as well as 3K bytes of RAM that can be expanded to 18K, converts Atari 2600 and Sears Video Arcade and Video Arcade II units for educational, household and business needs, the 36-by-16 characters displayed on any black-and-white or color television. A powerhouse of Entex software cartridges, from finance and speed reading to beginning algebra (with more to come), ensures a wealth of dividends on your relatively small initial investment.

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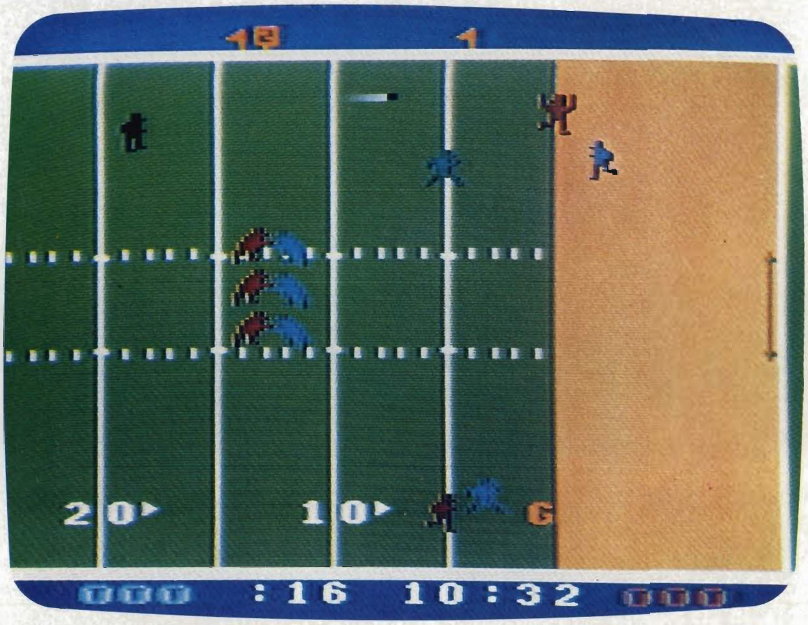

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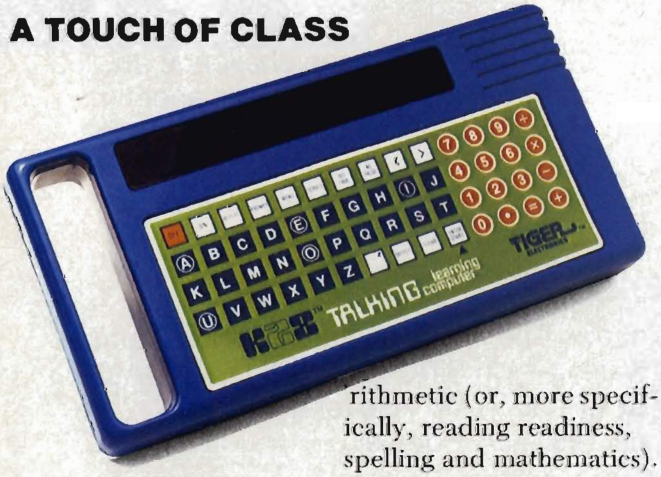
ALL IN ONE

It's a computer; it's a TV; it's a game. It's **Ultravision** (2315 N.W. 107th Avenue, Miami Free Zone, Miami, Fla. 33172, 305-592-0878; about $600). Completely self-contained, the unit delivers all the excitement (via two fast-action, sixteen-position, dual-firing-position joysticks), sights (including 3-D rotation and zoom) and sounds (from music to cheering crowds and explosions) of your neighborhood arcade. It plays almost all existing game software, as well as instantly hooks up to any home computer, VCR or video camera. The ten-inch-diagonal, UHF/VHF color monitor projects resolution and brilliance far superior to that delivered by standard televisions, while a line of computer peripherals targeted for early next year will forestall obsolescence.

TIME: 0116
SCORE: 0000
Ultravision
Ultravision

Weighing under ten pounds, powered by an advanced Z80 microprocessor (the same chip behind the TRS-80, Xerox 820 and other costly personal computers) and operating on AC/DC current or through its cigarette-lighter adaptor, Ultravision is electronics' state-of-the-art statement.

A TOUCH OF CLASS



The latest teacher's pet is Tiger's **K28 Talking/ Learning 64 Home Computer** (Tiger Electronic Toys, Inc., 909 Orchard, Mundelein, Ill. 60060, 312-949-8100; about $80), the first of its kind to offer an unprecedented 1500-word vocabulary and activities in all three "R's"—reading, 'riting and 'rithmetic (or, more specifically, reading readiness, spelling and mathematics). A veritable encyclopedia of opportunities for children in kindergarten through the eighth grade, the solid-state, high-impact-plastic unit features four snap-in cartridges (additional modules available), fifteen learning modes, 56 keys, an AC adaptor and headphone jack.

STOREKEEPER

Reliable personal program storage and retrieval is at your fingertips with GE's **Computer Program Data Recorder** #3-5158 (about $53). Designed to prevent the information loss often resulting with conventional voice recorders, it features a three-digit program indicator, rotary tone control that allows for precise adjustments and, thus, compatibility with many systems, as well as an LED for data record and play. With a bright silver-tone finish, the unit combines today's look with tomorrow's technology.

COMPUTER PROGRAM DATA RECORDER

PANDEMONIUM

PANDEMONIUM

By Norman J. Wazaney Jr.

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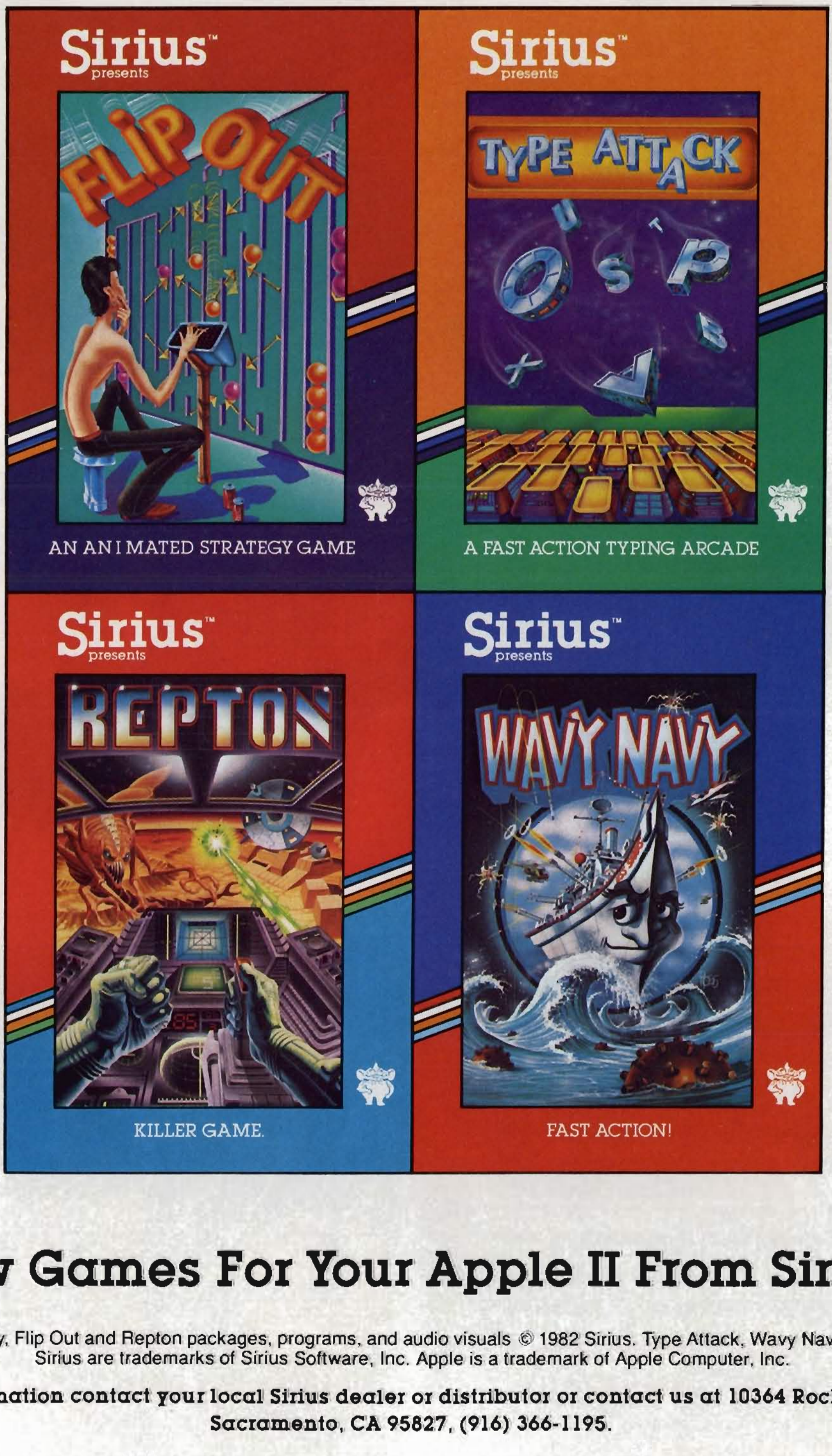
Take your marble to the top. Pick your spot and let it drop. Hope for a flip instead of a flop. Once you get it, the fun never stops! It's FLIP OUT — a crazy new strategy game for one or two players. Each marble you drop causes a chain reaction, so take your time and plan carefully. Plan right and you'll flip, if you didn't you Flip Out!



Turn your keyboard into a typing arcade! You can blast attacking letters and words right out of the sky. Type Attack was designed by a professional educator and the fast action game experts at Sirius. It features 39 pre-programmed lessons and 60 user defined lessons. Great sound, graphics and a real-time words per minute bar make improving your typing skills fun!

It is up to you to stop the invasion of the evil Quarriors and save Repton. You are armed with devastating Nuke Bombs, a Radar Screen, a Laser Gun and an Energy Shield. You'll need them all! You'll be attacked by Nova Cruisers and Single Saucers. You must avoid Spye Satellites and deadly Dyne-Beam Shooters and you must stop the Draynes from depleting the Reptonian power supply. Repton is a battle so thrilling you'll be relieved to find out you're still on earth when it's over!

Talk about adventure on the high seas! You're blasting away at a squadron of enemy bombers and Kamikaze fighters from the deck of your P.T. boat. Suddenly you notice the sea is loaded with mines and an Exocet missile is screaming toward you on the horizon. Instinctively you jerk the joystick to the starboard, keeping your thumb on the fire button. Phew! That was close! Sometimes it's hard to believe Wavy Navy's just a video game.

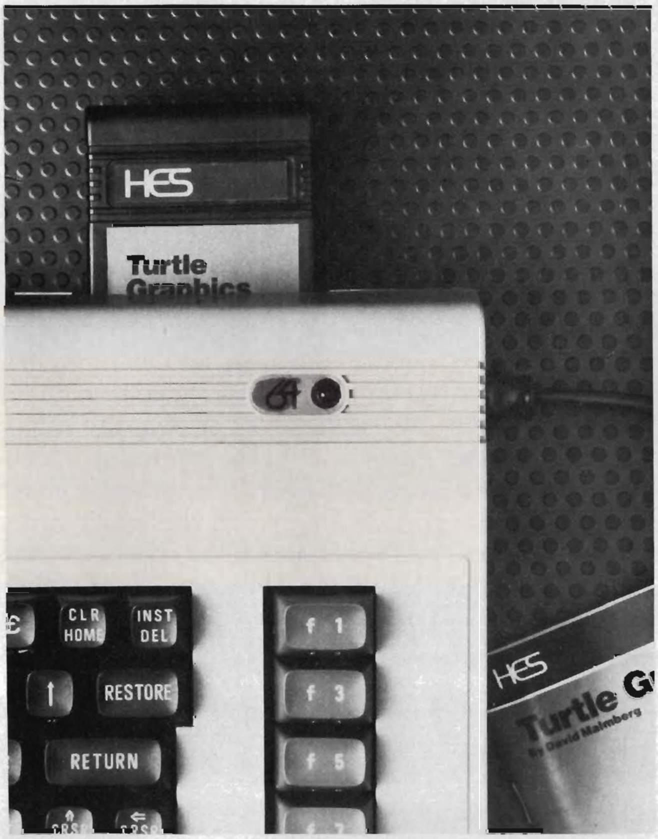
New Games For Your Apple II From Sirius™

Type Attack, Wavy Navy, Flip Out and Repton packages, programs, and audio visuals © 1982 Sirius. Type Attack, Wavy Navy, Flip Out, Repton and Sirius are trademarks of Sirius Software, Inc. Apple is a trademark of Apple Computer, Inc.

For more information contact your local Sirius dealer or distributor or contact us at 10364 Rockingham Drive, Sacramento, CA 95827, (916) 366-1195.

COLOR CODING

HES (Human Engineered Software, 71 Park Lane, Brisbane, Calif. 94005, 415-468-4900), makers of small-system game, language and utility cartridges, is further illustrating its ingenuity with **Turtle Graphics** (about $40) and **Turtle Graphics II** (about $60). Compatible with VIC 20 and Commodore 64 they can be mastered in minutes to create colorful pictures while learning programming basics.



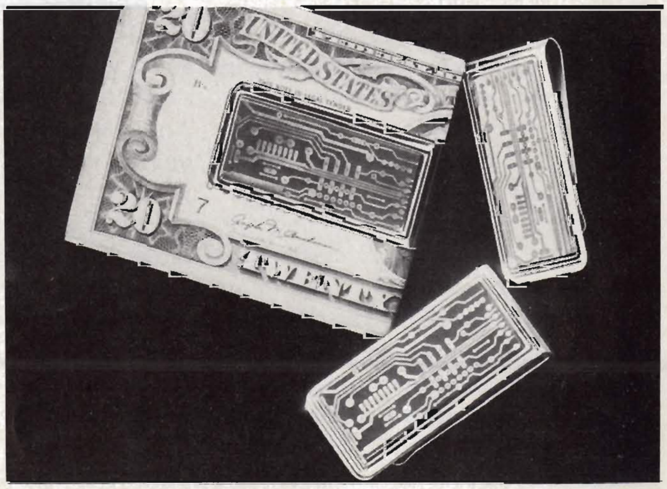
DESK SET

Form follows function in the **Model 1685 Compu-Table** from Gusdorf (6900 Manchester Avenue, St. Louis, Mo. 63143, 314-647-1207; about $70). An eminently affordable companion to your personal computer system, its sturdy steel, long-legged base is topped by an 18-by-31½-inch desk plus an adjustable hutch that puts the monitor at eye level. With a scratch- and stain-resistant hickory finish and clean, crisp lines, the Compu-Table is compatible with most home-furnishings programs.

CIRCUIT BREAKTHROUGHS

Computer FX, Inc. (P.O. Box 487, Okemos, Mich. 48864), is electrifying the fashion accessories field with its new circuit-sparked creations (about $4 to $15). Incorporating an authentic nickel or copper circuit board against a high-gloss background, the adult line of **Computer Creations** includes belt buckles, business card and contact lens cases, key chains, money clips and pill boxes, while the youth-oriented **Short Circuits** collection offers barrettes, belts and buckles, key chains, pendants and pins. On the drawing board are circuit-imprinted fabrics and posters, as well as limited-edition sterling silver, gold and gem-encrusted *objets*—also bound to put a charge into gift-giving. ●

COMPUTER FX INC
LAWRENCE MEYERS, JR.
PRESIDENT



TEST RUN

A New World of Videotex Services Comes Home

By Carol A. Emmens

In 1961, Newton N. Minow, then chairman of the Federal Communications Commission (FCC), called television a "vast wasteland." Today, however, we're on the verge of what will turn our sets into a garden of information.

In addition to watching "Magnum, P.I." and playing Pac-Man on TV, imagine reading up-to-the-minute news, stock-market, weather and travel reports; armchair shopping; sending birthday cards; and voting. It's likely that by the end of the decade, you'll be doing these and more when teletext and videotex—popularly known as "electronic publishing"—become more widespread.

A one-way system, teletext transmits "pages" from a central data bank, which are converted into electronic impulses, then carried over a TV signal's unused lines or vertical blanking interval. These "pages," usually numbering in the hundreds, are transmitted in a recurring cycle, while the viewer, using a keypad or keyboard, selects one for his decoder (chip) to grab and relay to his screen. (In contrast, many cable TV systems feature an open-face scroll showing the day's schedule, which means you have to wait for "pages" to change, rather than request the next when you're ready.)

On the other hand, videotex, or viewdata, is a two-way system by which a computer(s) is linked to an "intelligent" terminal via the telephone or two-way cable lines. It allows the consumer to send and receive messages, shop, bank and answer questions, with the number of "pages" theoretically limitless.

Scores of companies are already participating in videotex trials, such as the one conducted by Videotex/America. Times Mirror, an international communications firm owning 57 cable TV companies, seven newspapers including *The Los Angeles Times* and magazines like *Popular Science*, in partnership with Infomart, Canada's leading electronic publishing company, formed Videotex/America to test services and market Telidon software in America. (Developed by Canada's Federal Department of Communications, Telidon is a leading graphic/text system for teletext and videotex.)

> "... the most popular services were the news, sports and weather, as well as banking..."

From March till December 1982, 350 families in California's Palos Verdes lived the world of the future as they participated in Videotex/America's test. Selected from volunteers who responded to ads, they were, according to vice-president of sales Abbott Ezrilov, "upscale middle-class" families who are "early adopters"—that is, people who now own products from microwave ovens to home computers, and who subscribe to at least one newspaper and/or magazine. Clearly, they're the ones most likely to subscribe to videotex when it's commercially available.

To participate in the study, each family was given a television set modified to receive high-resolution graphics, a decoder, modem, device linking the decoder (chip) to the computer via telephone lines (used by 200 families) or two-way cables (used by 150). The number of "pages" changed daily, but averaged about 70,000. In addition, the families were provided access to services like the Associated Press wire, so that they could read the news as it broke. (If they preferred, brief summaries prepared by *The Los Angeles Times* and other newspapers were likewise screened.)

Approximately 60 companies from Bank of America and Sears to Hallmark Cards acted as Information Providers (IP's) providing such services as electronic banking, mail, first aid, weather and shopping. The IP's provided their own software but weren't charged to advertise (although there's little doubt that they will be in the future).

As Videotex/America predicted, the most popular services were the news, sports and weather summaries, as well as banking. Ezrilov claims that "home banking—the ability to pay bills, check balances and transfer funds—is going to be a vital part of any videotex service." He even goes so far as to say that videotex probably won't survive unless it offers electronic banking, predicting that by the year 2000, it'll be "quite cumbersome" to transact as we do today. He notes, "Economically, it won't be feasible for banks to provide passbooks and return checks." Once they begin to charge consumers for each

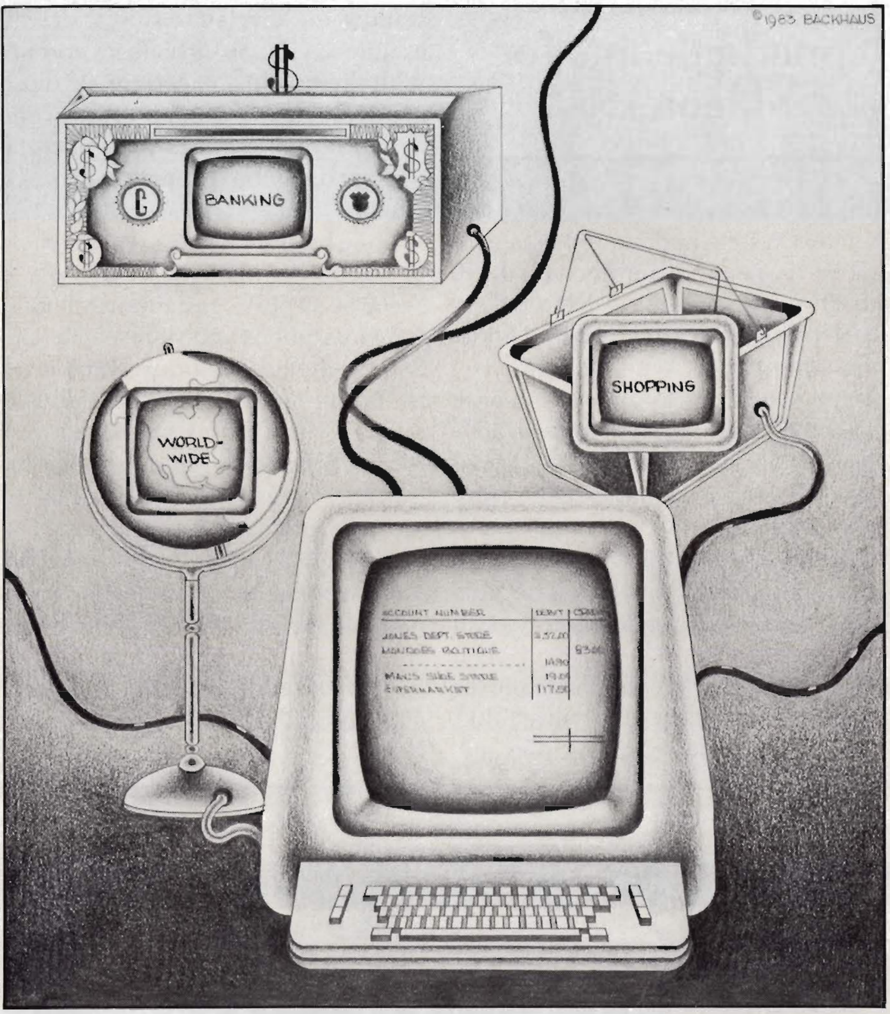


Illustration By R. B. Backhaus

check, the public will be more willing to move toward a "checkless, cashless society." He adds, "I see the cashless part ahead, because we're already experimenting with 'smart cards,' or automatic debit cards."

Extremely popular, too, was videotex shopping for theater and sporting events tickets, basic clothes and name-brand products, especially electronic and photographic equipment (logically, all types of mail-order goods were ordered). Grocery shopping wasn't very well-received, although Ezrilov believes it could catch on with the elderly and city dwellers, especially in cold-winter states like Minnesota.

"It started off very low-key," says Ezrilov of electronic mail. At first, testers were apprehensive, perhaps envisioning the likes of Big Brother, but then it took off, its overwhelming popularity eventually surprising him. People sent messages, put up bulletin boards and used it "like a C.B."—to chit-chat, ask for dates and post personal ads. Similarly, extensive use was made of Hallmark's humorous, animated "cards." Ezrilov believes it probable that consumer fees will be imposed on electronic mail, primarily to keep its amount under control.

FEES

Taking part in a free videotex trial is far removed from subscribing to such a service, but in order to test the market, in September, Videotex/America instituted fees from $10 to $40.

When the fees were levied, families did drop out, citing reasons like "I'm too busy," "It's too complicated" or "No one in my family uses it." Yet, Ezrilov found "more familes staying in than we'd projected." And, surprisingly, there was no correlation between the amount charged and the families who dropped out. Says Ezrilov, "Either they perceived videotex as valuable, or they didn't."

At least on the surface, the results of this trial seem to indicate that a market exists for videotex. However, Ezrilov, doesn't want the fact that fewer families relinquished the service than expected to "lull us into a false sense of security." Videotex can't succeed unless it reaches a mass market, as it costs the same to maintain a data bank for 250 subscribers as for 250,000.

THE FUTURE

There are still too many unknowns to predict when videotex will become a reality. According to Ezrilov, it may be available by this year's end in selected major cities but, more likely, it'll be 1985 or 1986 before there's a real foundation for it, and the decade's end before smaller cities receive it.

A number of services, such as The Source and CompuServe, are labeled "videotex" but, says Ezrilov, "they're really time-sharing services, and any terminal—what we call 'dumb' terminals—can access the information. They're pure text, not encoded, so you don't need a decoder." (The Source, a Reader's Digest subsidiary, and CompuServe Information Service are communications networks accessible by small computer via telephone lines. Both offer news, airline schedules, classified ads, stock-market prices and how-to information.)

Videotex and teletext, though, are encoded, but only a very limited number of decoders are on the market, through companies like Norpak, a Canadian firm manufacturing Telidon videotex and teletext terminals, as well as other specialized video equipment. It's a which-comes-first-the-chicken-or-the-egg situation: Without videotex services, there's no demand for decoders, and without decoders, there's no mass market for videotex.

By the mid-Eighties, Ezrilov is confident that computers will come equipped with decoders. In fact, Apple has already purchased thousands of Telidon decoder boards for its Apple II's and III's, while Atari is strongly interested in making an optional decoder board. The big push will come when TV manufacturers start offering decoders as an option, or when they build them into sets themselves.

Both CBS and NBC have announced they'll launch teletext services within the year, so it's likely that RCA—which owns NBC—will soon manufacture decoders for an estimated retail price of $150 to $200.

According to Ezrilov, teletext will help pave the way for videotex by "exposing people to information services, as opposed to regular programming and electronic games." But will people pay for videotex when teletext will be free? "Yes," says Ezrilov. "Teletext has two limitations, both severe. One is that your access ability is restricted. When you use a teletext system and request a page of news, the response time could take 10 to 20 seconds. If you're sitting in front of a TV, waiting, that's an incredible amount of time. With videotex, you get the next page as soon as you push a button. The other is that about 5000 pages is considered the teletext maximum—a drop in the bucket compared to what videotex can offer."

> **". . . the results of this trial seem to indicate that a market exists for videotex. . ."**

Even if teletext is free (Ezrilov is frankly skeptical it will be), he foresees consumers paying for tiers of videotex services because of their vast potential contents. "I can see the time when we'll have the entire Bible, 'World Book Encyclopedia' plus anything else that's out there on videotex services." Plus, because it'll be a two-way system, consumers will be able to bank, shop, even vote at home. Ezrilov foresees that videotex will be cost-effective, compared to buying stamps and driving to stores, as well as time-saving, so virtually everyone, with the possible exception of those at poverty level, will subscribe to one or more such services (two or three will probably be competing in major cities).

Long before videotex reaches most of our homes, though, we'll begin to see it at airports, restaurants, hotels, railway stations and sightseeing centers. Videotex/America will be introducing Teleguide systems throughout the United States, providing tourists with up-to-the minute information on where to stay and eat, what to see plus prices and times; says Ezrilov, these will pave the way for videotex. "When it's time to commercialize videotex full-scale, hopefully, the vast majority of people will have seen and/or used the service already and say, 'I want it in my home.' " ●

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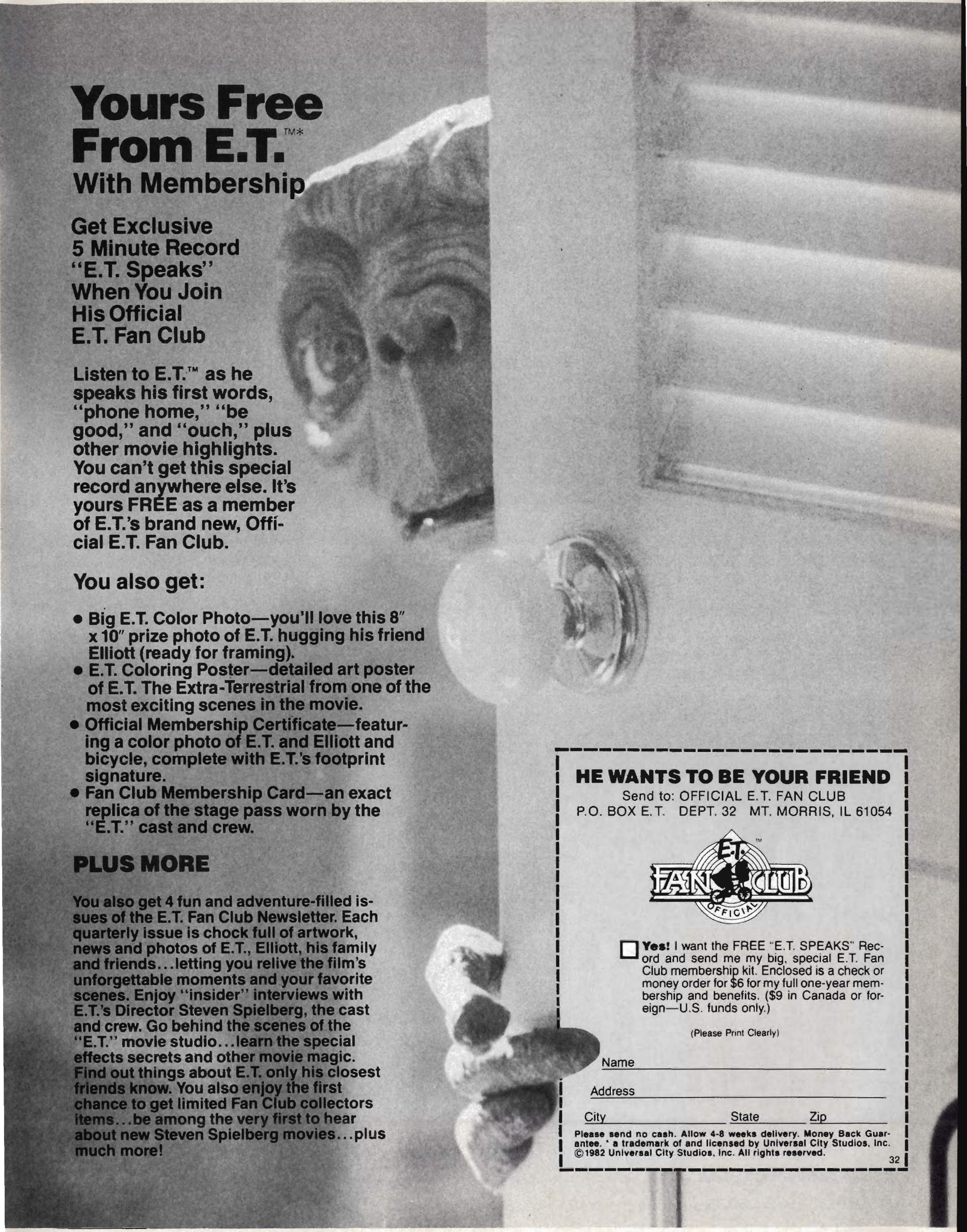

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GETTING GRAPHIC

VISUAL EFFECTS

Discovering the Sights of Computer Artistry

By Hal Coors

A picture is worth a thousand words," claims an old adage. According to recent studies, though, people can read at a rate of 600 to 1200 words per minute but can understand anywhere from 48 to 72 million presented graphically. So, one picture is worth more like 100,000 words and, thus, the growing emphasis on computer graphics.

Anyone who's been routed a pile of computer sheets loaded with statistics can appreciate the need to reduce this enormous data to a more comprehensive form. Computer graphics offer the capability of absorbing and reducing it to bar charts, flowcharts and graphs that can display trends and/or concepts. Software packages, called charting programs, can combine information from the user's file and generate quickly grasped pie or bar charts, as in *Fig. 1*.

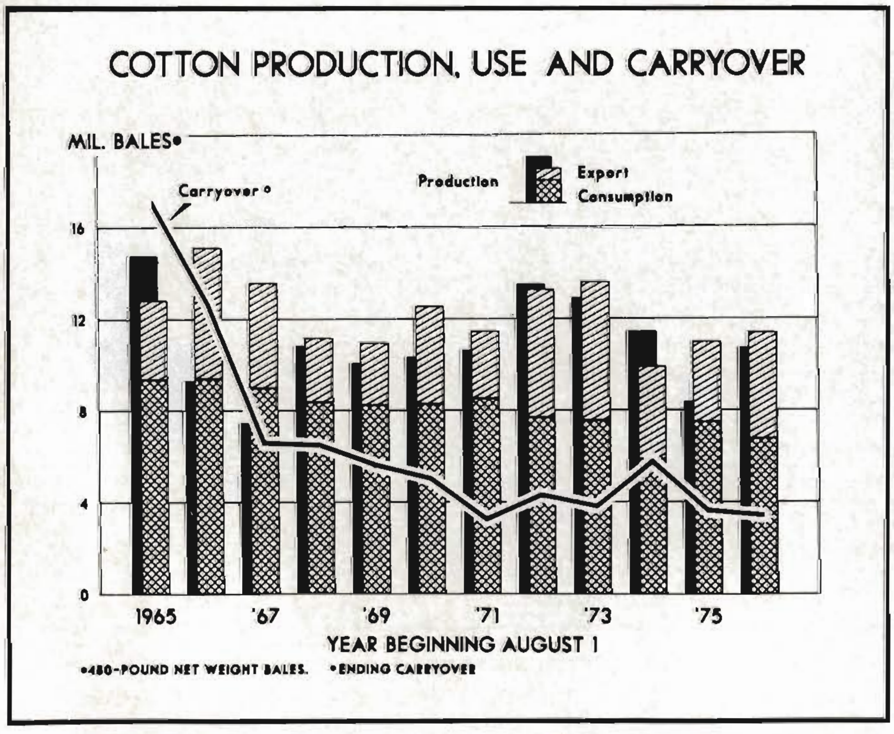


Fig. 1 Bar charts and a curve bring meaning to otherwise static numbers.

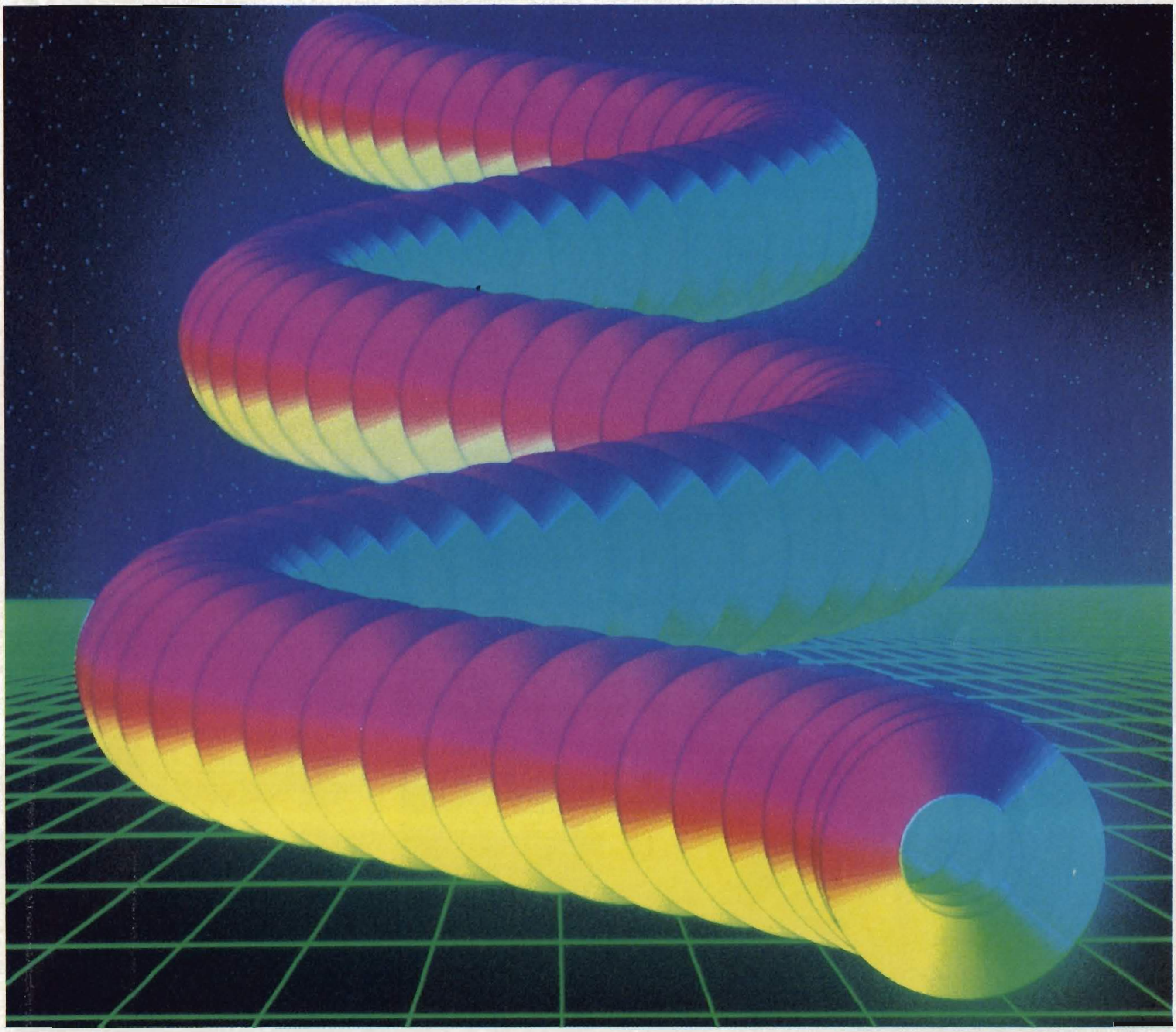
Thanks to computer graphics, more than 10 million American households enjoy games like Atari's video computer system (VCS) and Mattel's Intellivision (*Fig. 2*). A responsible force for moving the public from the movie theater back home, video games are now being challenged by the film industry, with computer-generated extravaganzas such as Walt Disney's "TRON" and George Lucas's "Star Wars."

The odds are, the next flight you take will be manned by a pilot trained on a computer-simulated landing system. Today's fuel costs dictate as much as $100 per minute to cover training on real planes, so most airlines are resorting to simulated training. High-speed computer circuits develop thousands of screen drawings in brief time intervals. Programming allows pilots to "land" on simulated runways at airports in all major cities under a variety of weather conditions.

But the computer isn't only for businessmen, engineers and scientists; it's been embraced by artists as a new medium. Instead of using a brush and oils or acrylics, an artist can pick up an electronic pen and graphics tablet, then express his thoughts on a TV screen, with the ability to modify shapes and colors at his whim. Whereas the Old Masters had no choice but to paint over those areas with which they weren't satisfied, computer artists can store work in the computer's memory, then erase, proceed and restore the original if so desired. A crude but rather interesting computer-drawn portrait is shown in *Fig. 3*.

COMPUTER GRAPHICS BASICS

Most personal computers use raster scanning, as found in your TV set. (In fact, most low-cost computers rely on the home television for display.) A black-and-white TV picture, if looked at closely, appears as a series of horizontal lines. These are created by an electron flow formed at the back or neck of the cathode ray tube (CRT) and aimed at a phosphor coat-



ing deposited inside the screen. When electrons hit the phosphor, spots of light are produced; if the electron flow is maintained as the beam is swept across the screen by a magnetic-defection field, lines are drawn. The intensity of the spots and lines depends on the voltage level applied at the electron gun. In the United States television system, the electron beam is moved from left to right at a rate of 15,750 lines per second, or 63 microseconds per line. Once the beam reaches the right-hand side, it's quickly snapped back to a lower left position and scanning repeats(*Fig.4*).

Thus, a "moving" TV picture is actually a series of images that changes slightly from one instant to the next. The eye's persistence of vision allows them to be perceived as continuous movement, as long as they're flashed by at sufficient speed.

A movie projector displays 24 images, or frames, per second but includes a shutter mechanism to increase that rate to 48, to avoid annoying flicker. For TV display, a rate of 60 scans per second provides 30 frames per second, the 60 scans interleaved, as in *Fig. 4*, to form two separate fields, slightly offset from each other. This, too, avoids objectionable flicker. So, a TV set displays a raster, or pattern, of 525 lines per frame (262½ lines per field), occuring 30 times per second for a total of 15,750 lines per second. Since interlaced scanning is complicated, it's relatively expensive to implement, but if it were abandoned and, say, 262 lines per frame were scanned 60 times per second, there would be less horizontal detail. On large-screen (25-inch) or projection TVs, viewing clarity would be sacrificed, so interlaced scanning is mandatory. On small-screen (9- to 13-inch) computer displays, interlaced scanning can be sacrificed to lower costs; thus, 262 lines per frame are used. Now, how do we get a picture, rather than horizontal lines, on the screen?

As the electron beam is rapidly

moved from left to right, it can be modulated or turned on or off (when on, it creates a spot of light). Thus, as shown in *Fig. 5*, a diagonal line can be created by keeping the beam off most of the time in lines 1, 2, 3 and 4, while the long horizontal line is formed by allowing the beam to remain on longer.

Raster graphics involves subdividing the screen into a grid of columns and rows (*Fig. 6*). Each display element, or rectangle, can be lit or turned off by computer instruction. Accordingly, it's possible to create letters, numbers, geometric shapes and pictures by informing the display (via computer program) which sections to illuminate. Obviously, the more elements per display, the better the picture's detail. For example, a circle generated in a 3x3 (3 column by 3 row) matrix, as in *Fig. 7a*, is rather crude; a 6x6-grid circle (*Fig. 7b*) is improved but still far from desirable. Now, consider a display using a 256 x 256 format. This technique of pixel (picture element) graphics, or dividing an area into cells, is used in Radio Shack, Commodore VIC, Timex/Sinclair, Apple and many other computers. (A display similar to the one in *Fig. 5* but created by an array of pixels in shown in *Fig. 8*.)

The resolution, or graphics capability, of low-cost home computers is determined by the pixel matrix arrangement. For example, the Apple II low-resolution mode offers 48x40 pixels—48 rows of 40 pixels each; in its high-resolution mode, 192 x 280. The Atari 400/800 in low resolution divides the screen into 800 sections (40x20); in its highest resolution mode, the matrix is an impressive 51,200—capable of quite elegant graphics.

Another approach to simple raster graphics is to make various geometric shapes (with horizontal, vertical and curved lines) by keyboard control, similar to creating letters and numbers by simply striking the appropriate keys. By preparing and running a computer program in which the shapes can be joined, pictures and drawings can be formed.

A more sophisticated form of computer graphics, vector graphics, is presently used with minicomputers

Fig. 2 Computer graphics make video games a new form of home entertainment.

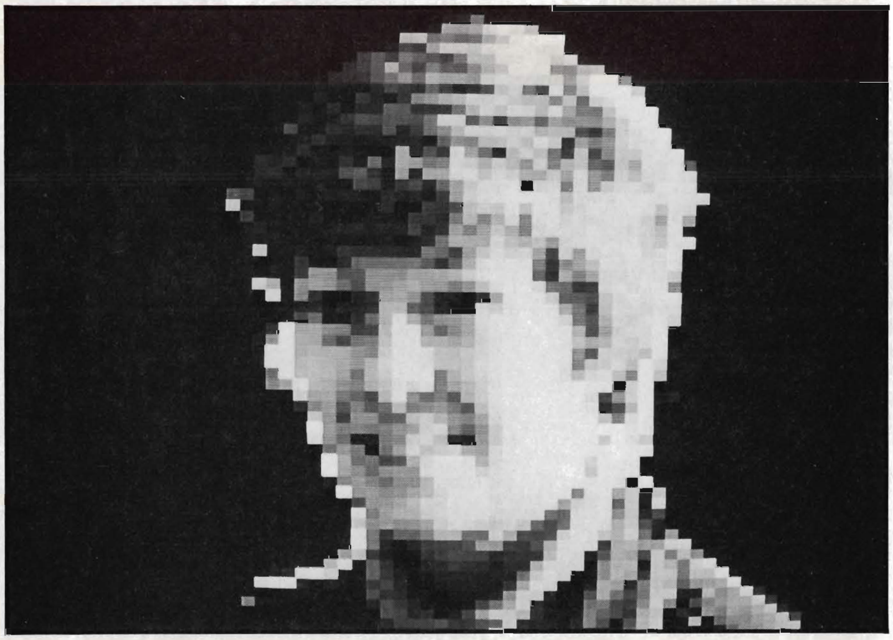


Fig. 3 A portrait prepared by low resolution graphics.

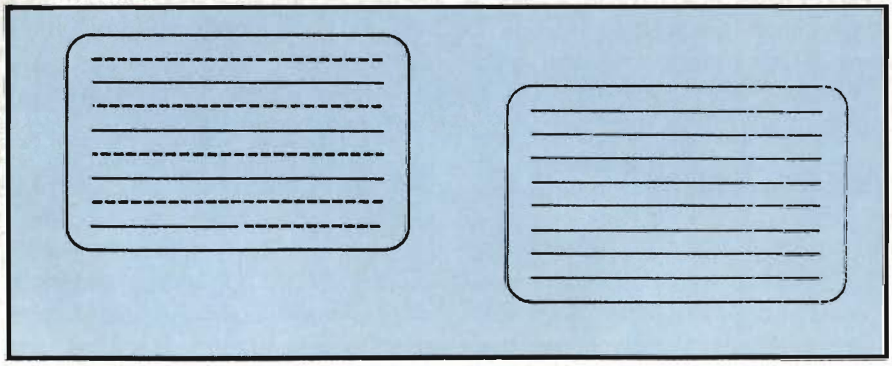


Fig. 4 *Left:* An interlaced raster-scanned display with alternating fields each composed of 262½ lines. *Right:* A non interlaced raster contains only 262 lines per field, over lapping the next 262 lines.

and arcade video games; as memory costs dwindle, it will also become feasible for low-cost home computers. Here, lines may be drawn between any two points on a video display tube. (With raster graphics, lines are created by connecting dots on closely-spaced horizontal lines.) Each point on the desired picture is identified with a pair of numbers for the X and Y coordinates, as well as the beam's "on" or "off" position. Just as a home TV set is an example of raster scan, an oscilloscope display is an example of a vector display. (The *Fig.* 5 display is drawn by vector graphics in *Fig.* 9.)

One final point: An electron beam bombards the phosphor, creating light dots and forming the picture. With TV sets, the station sends a steady stream of electrical impulses to keep the fields and frames repeating; this is called video refresh. Computers would require a high rate of data flow to compute new data for each scan so, to offset this liability, they may include a memory section for video refresh. Otherwise, the video terminal used for the computer system must include its own video refresh memory, independent of the computer's.

HOW ARE PICTURES DRAWN?

To draw pictures, graphs or other forms of artwork, input, or instructions, can be fed via the computer keyboard or with paddles and joysticks similar to those used in video games. More sophisticated (and expensive) methods involve digitizers, or graphics tablets, light pens and trackballs.

Since every computer includes a keyboard, graphics can be drawn using letters and symbols (the letter "l" for a vertical line, a hyphen for a horizontal line). However, the resultant pattern may be crude, and keyboard manipulation boring. A paddle is somewhat like a TV volume control; rotating the knob changes resistance value, which is translated by the computer's circuits to signify movement along the display. Similarly, a joystick conveys screen dot direction via four switches (for up, down, left and right).

A digitizer, or graphics tablet, allows

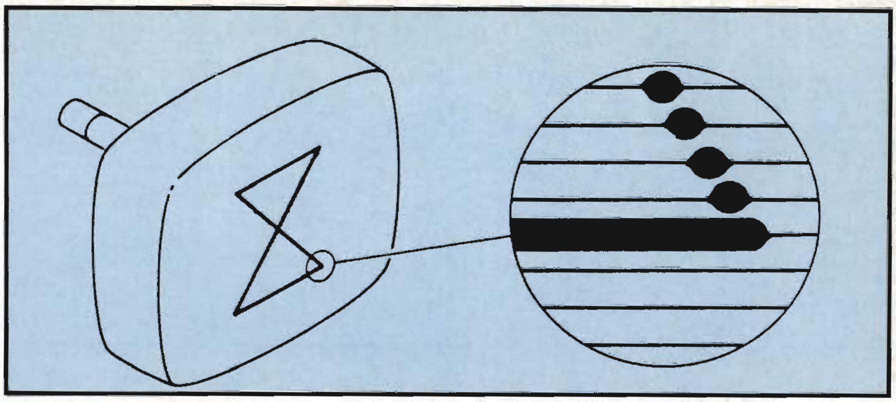


Fig. 5 An image formed on the raster-scan display by turning on dots at appropriate time intervals.

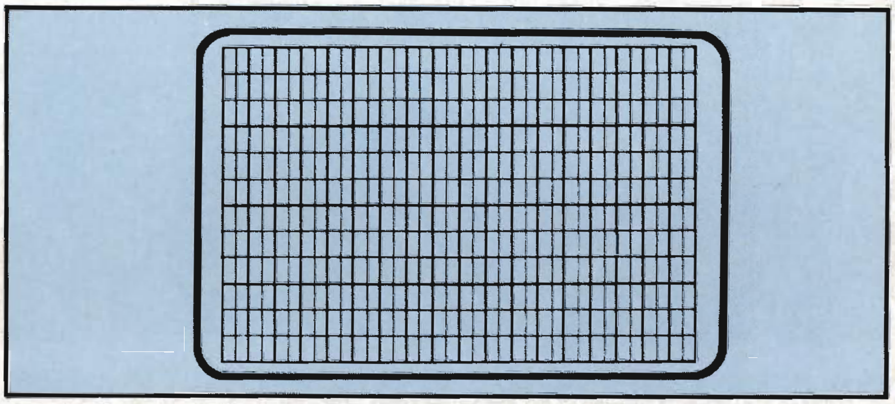


Fig. 6 A screen divided into a grid, with each area capable of being turned "on" or "off."

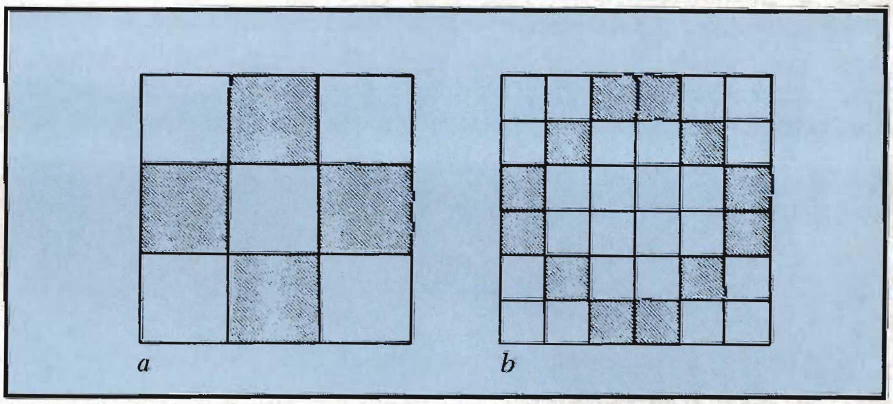


Fig. 7 A circle is difficult to depict on a coarse 3x3 grid *(a)*. It becomes more obvious on a 6x6 *(b)*, and increasingly so as more rows and columns are added to a given area.

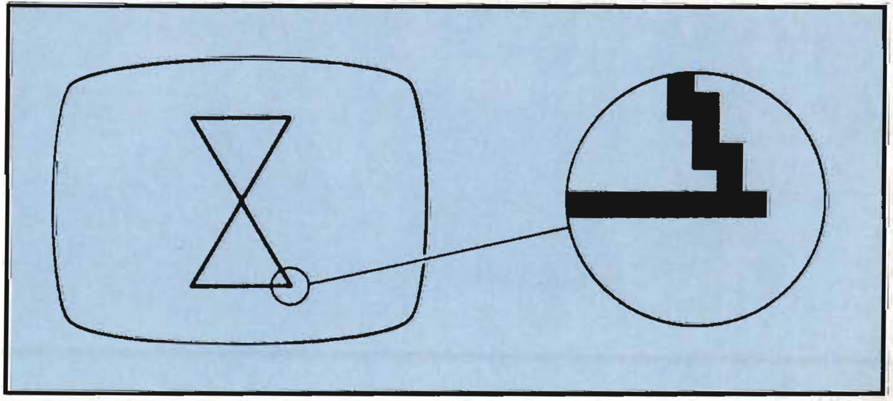


Fig. 8 *Fig.* 5 shown with details filled in by pixels, or picture elements.

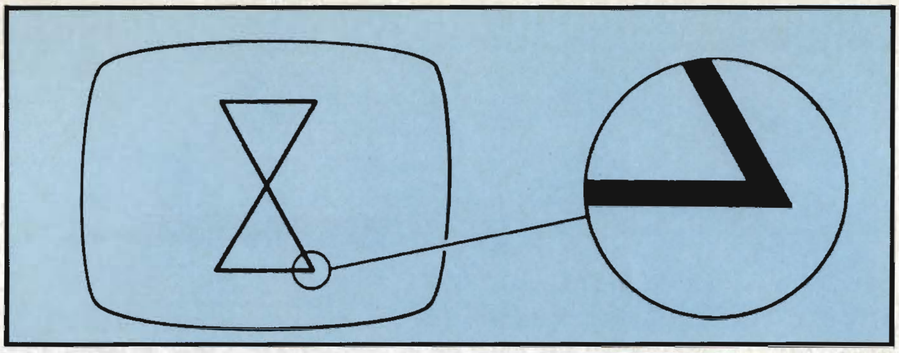


Fig. 9 Vector scanning, contrasted with raster scanning, offers sharper edges.

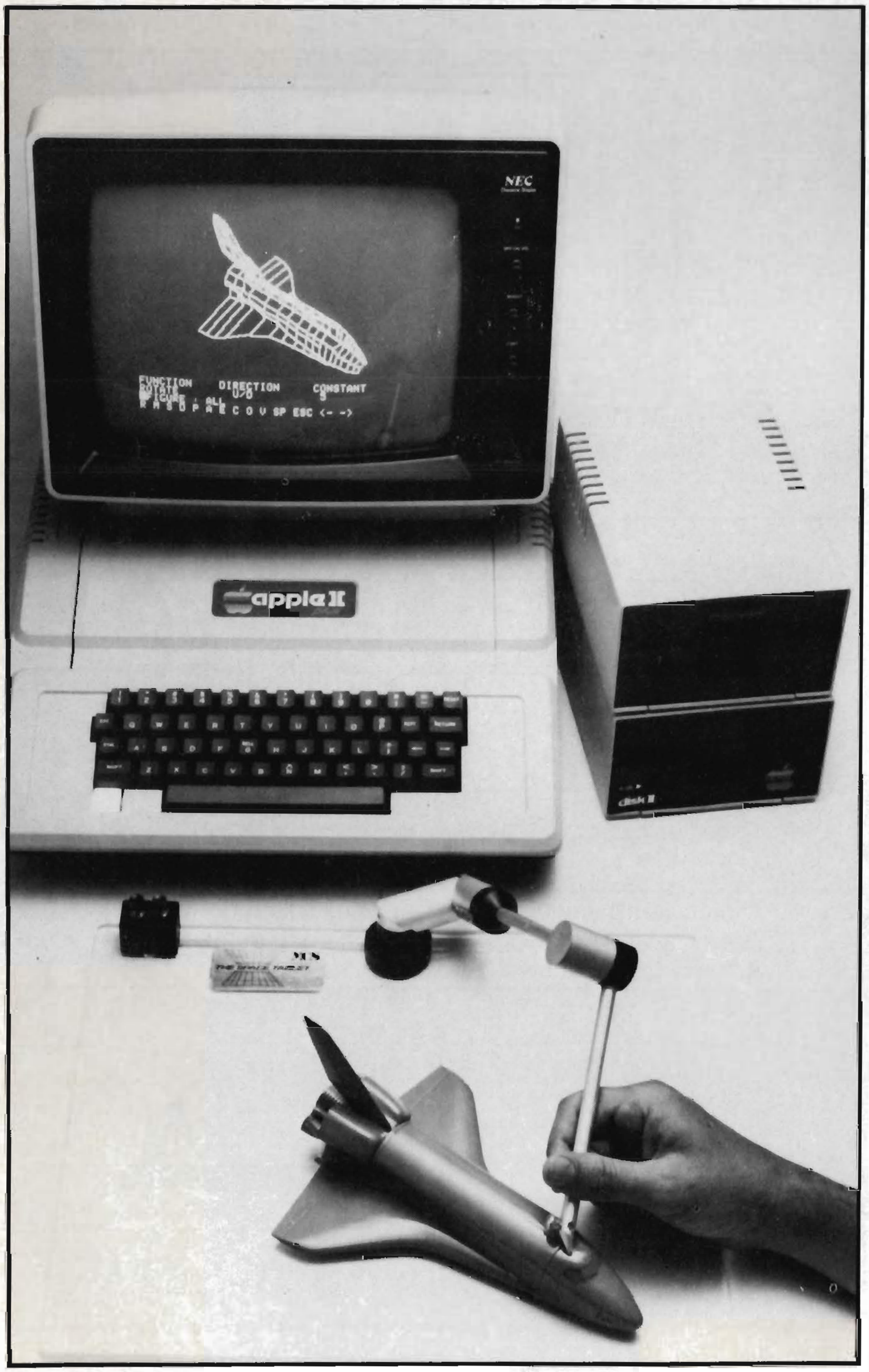


Fig. 10 A three-dimensional digitizer creates a computer-aided design on an Apple II.

the user to move a "pen" across a surface of finely meshed horizontal and vertical wires. As it traces its picture, the computer is informed of X and Y coordinates and, thus, the position of the electron beam and dots on the display screen. A three-dimensional digitizer is shown in *Fig. 10.* A light pen arrangement consists of a sensor built into the tip of a device resembling an ordinary pen. When the light pen, connected by wire to the computer, is pointed at a position on the screen, X and Y coordinates are indentified and routed to the computer.

Arcade-game players are familiar with the trackball, a small sphere contained in a box with only a small portion exposed. The direction and speed of manipulation provide sector information to the computer. Trackballs supply information upon movement, while light pens and digitizers supply relative position information.

PAINT GRAPHICS' FUTURE

There's an enormous amount of interest—and company investment—in computer graphics. As computer data sheets pile up, businessmen are beseeching software and graphics designers to introduce understandable chart presentations, while the video game business is eagerly awaiting 3-D and multilevel games with as many as 50 players. Educators are ecstatic about the inroads being made with students taught by computers; business portfolio managers are handling their stock and bond investments, experimenting with trend curves and business cycles shown by computer graphics at home. Engineers designing bridges, buildings, hydraulic equipment and hosts of mechanical devices depend on computer graphics to participate in their CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) projects.

As a final interesting note, graphics terminals are an integral element in the design of semiconductor VLSI (Very-Large-Scale-Integrated-circuit) chips. Thus, computer graphics, drawn from sophisticated semiconductor chips, are instrumental in designing more complex chips. ●

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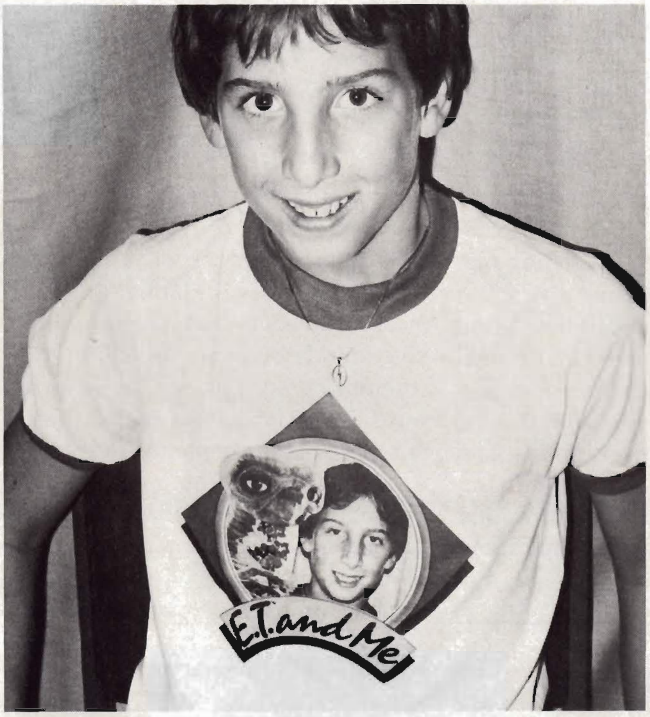

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ADVICE AND CONSENT
A Beginner's Guide to Improving Computer Literacy

By Lois Cantwell

When a new computer is brought into the average home, it's used to play video games over 80 percent of the time. After a while, owners begin to see further potential, but they have no idea how to go about improving their computer literacy. With the proper additions, a computer can aid in financial planning, while even the games can become more sophisticated (users can plot a mythical kingdom's budgets or redirect the Battle of the Bulge instead of simply shooting down space invaders).

If the above is the case for you, your first step in improving computer literacy (c.l.) should be in the direction of the local library. Even though most don't offer a selection of software, you'll be able to read and research many of your questions. In the periodical guide alone, you'll find hundreds of entries. For example, animation, arithmetic, case studies, forecasts, innovations, crime, graphics, terminals, programs, software and more are covered in publications from Time to Ms. to Omni. Other sources for improving your c.l. include:

Books: As opposed to researching traditional fields, books aren't necessarily the best way to learn about computers. Often, these books have deceptively simple titles, like "Beginner's Guide to Personal Computers," but they might quickly have you involved in enough college-level math to convince you to abandon the field. If you must read an entire book on the subject, try one of the many written for children; they're simple, concise and clear.

Salesmen: Probably your best source for improving c.l., salesmen earn their commissions not only by selling machines, but by handling questions and problems. After sufficient comparison shopping, when you do buy, make sure to ask about the most frequent applications for your model plus any tips, hints, shortcuts and suggestions. There's intense competition out there for home computer dollars, the stores want your brand loyalty. Many chains, such as Radio Shack, and independent stores run classes and seminars for purchasers. Your salesman will be able to direct you to the instruction that's best for you.

> "... make sure to ask about the most frequent applications for your model ..."

Schools, seminars and classes: High schools, technical colleges, universities, computer companies and software outlets are just some of the organizations providing computer courses. The cost of these classes runs from $5 to $25 per hour, depending upon level of complexity, but since everyone's computer needs differ, it pays to figure out what you want to learn. For example, if you want sufficient familiarization to be able to understand your child's homework, you'll need a different course than an accountant who seeks to enhance his business skills or writer who requires WordStar. Typical of universities offering courses is Manhattan's New York University, which runs intensive one-day courses on either introductory computing or specific problems. If you live in an isolated area or simply can't budget enough time for a regular class, you may want to enroll in a computer correspondence school. Using home study tools, you can progress at your own pace (write to the National Home Study Council, 1601 18th St., N.W., Washington, D.C. 20009, for information on schools offering courses).

Computer clubs: You might feel at sea during the first few meetings of user groups, but it will soon become clear that these are average people, not mad scientists. There are basically two kinds of user groups: one is for particular types of computers (there are hundreds of clubs, for example, for the TRS-80 throughout the country); a more generally based club might be one like the Boston Computer Society, usually divided for those interested in similar applications. As a bonus, most user groups maintain libraries and/or offer discounts on software.

Cable TV: As the popularity of home computers increases, the number of cable network and access shows will, too. One already in operation on the Satellite Program Network (SPN) is the "Personal Computer Show," telecast nationwide on Thursday at 7:30 P.M., E.S.T. Some of the subjects covered are new products, computer news and general entertainment.

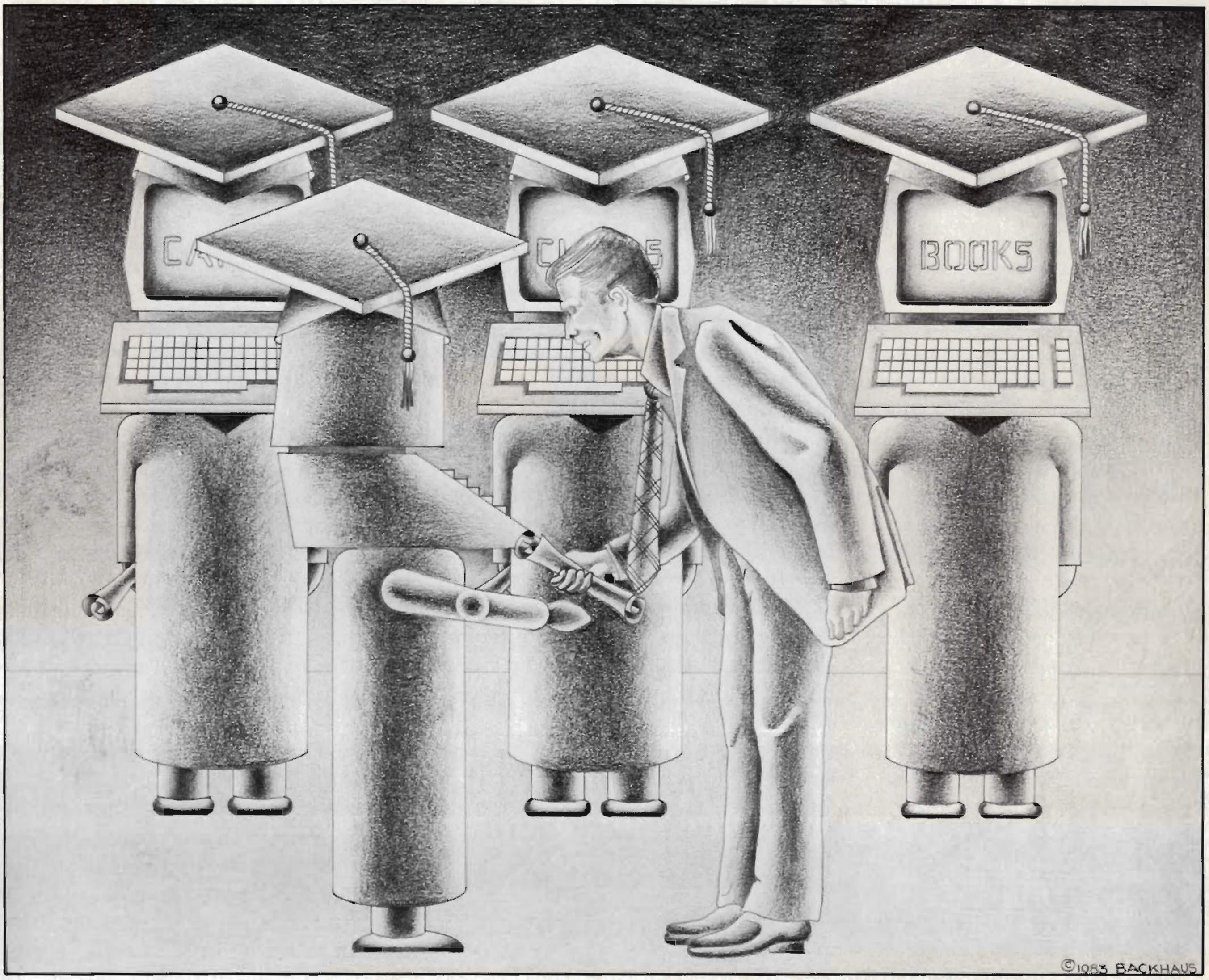


Illustration By R. B. Backhaus

Computer book clubs: Notably the Small Computer Book Club of Riverside, N.J., offers savings of up to 50 percent on such subjects as computer chess, music, software and programming techniques.

Electronic bulletin boards: Services such as The Source in McLean, Va., CompuServe of Columbus, Ohio, and BRS/After Dark of Latham, N.Y., provide news, electronic mail, games, software rental, access to medical journals and much more for initial fees of $50 to $100 plus rates of $6 to $18 per hour for access. Especially interesting are the electronic mailboxes, which allow you to communicate with other users and enthusiasts across the system—like a super-CB!

Computer camps: The most well-known are those run by Atari in San Diego, Calif., Sheboygan, Wis., East Stroudsburg, Pa., and Asheville, N.C. For a rather stiff fee (over $1500 for a four-week session, close to $3000 for eight) campers have the opportunity to learn about bits, bytes, RAM and ROM on Atari 400 and 800 computers. There's one instructor for every five or six campers, one machine for every two. The age range is from ten to eighteen, but don't lose heart if you're older and want to learn BASIC in a sylvan environment. Computer Camp, Inc., of San Diego (800-235-6965) runs adult sessions on Apple, Atari, Commodore, Texas Instruments, IBM PC and other computers in its lake-front camps.

In its recent "Man of the Year" issue, Time observed that "computer literacy has now become synonymous with being young, intelligent and employable; everyone else is the opposite." Surprisingly enough, though, computer literacy isn't difficult to master. Your personal c.l. will naturally expand into the area in which you're most interested—that is, if you're going to be using your machine to run a small business, you'll want to consider learning software packages for payrolls, tax and personnel. If your computer knowledge concerns a child, you'll be shopping around for educational and entertainment software. By just sitting down and figuring out your needs, you'll be able to begin expanding your knowledge. ●

SOFTWARE SIGHTS

VIEW POINTS

What to Look for in Programming

By Todd Katz

When Time magazine put a home computer on its year-end cover and declared that the "Machine of the Year" had "moved in," its five-year journey from a few basements and tinkerers' garages to the public consciousness was nearly complete. But if hobbyists and other computer enthusiasts needed a more trendy sign that this new hobby had gone "big league," it was supplied by the decision of a true software merchant to open a chain of stores.

Even more recently, Tadahiro Sekimoto, president of Nippon Electronic, told The New York Times, "He who controls software, controls the world." Why this excitement over software? What does it have to do with our computers? What are the different kinds?

SOFTWARE HISTORY

The computer was first conceived by Charles Babbage, a nineteeth-century English mathematician. His invention never really got off the drawing board because the technology of the day was unable to produce parts to his exacting standards. Like the modern computer, Babbage's Analytical Engine had a calculation center, storage area (memory) and place for instructions—delivered on punched cards, much like player piano rolls.

The first modern computers were developed during and just after World War II, their software continuing to be on punched cards or tapes similar to those envisioned by Babbage. From the beginning, these computers were capable of performing specialized tasks (particularly repetitive tasks that could be reduced to mathematical formulas or instructions) very rapidly. But, without specific step-by-step orders, or software, they really didn't know what to do.

It wasn't long before programmers decided there wasn't much point in punching information onto manila cards, so the keypunch operator was born. This system lasted until the television was married to the typewriter, creating the first computer terminal. Then, restless programmers realized it would be more practical for most software information about a task to be preloaded into a computer, perhaps with the option to make changes through cards or switches. So, large portions of the operating instructions for computing activities were loaded each time a machine was turned on. These magnetic tapes have evolved into our operating systems.

> "... it's immediately available whenever the computer is turned on..."

Today, there's yet another type of software: the instructions on silicon chips, also known as integrated circuits. ("Microprocessors," the brains of home microcomputers, are specially designed integrated circuit memory chips holding critically important information that, among other things, enables an operating system to load and a programmer to instruct the computer through an assembly language.)

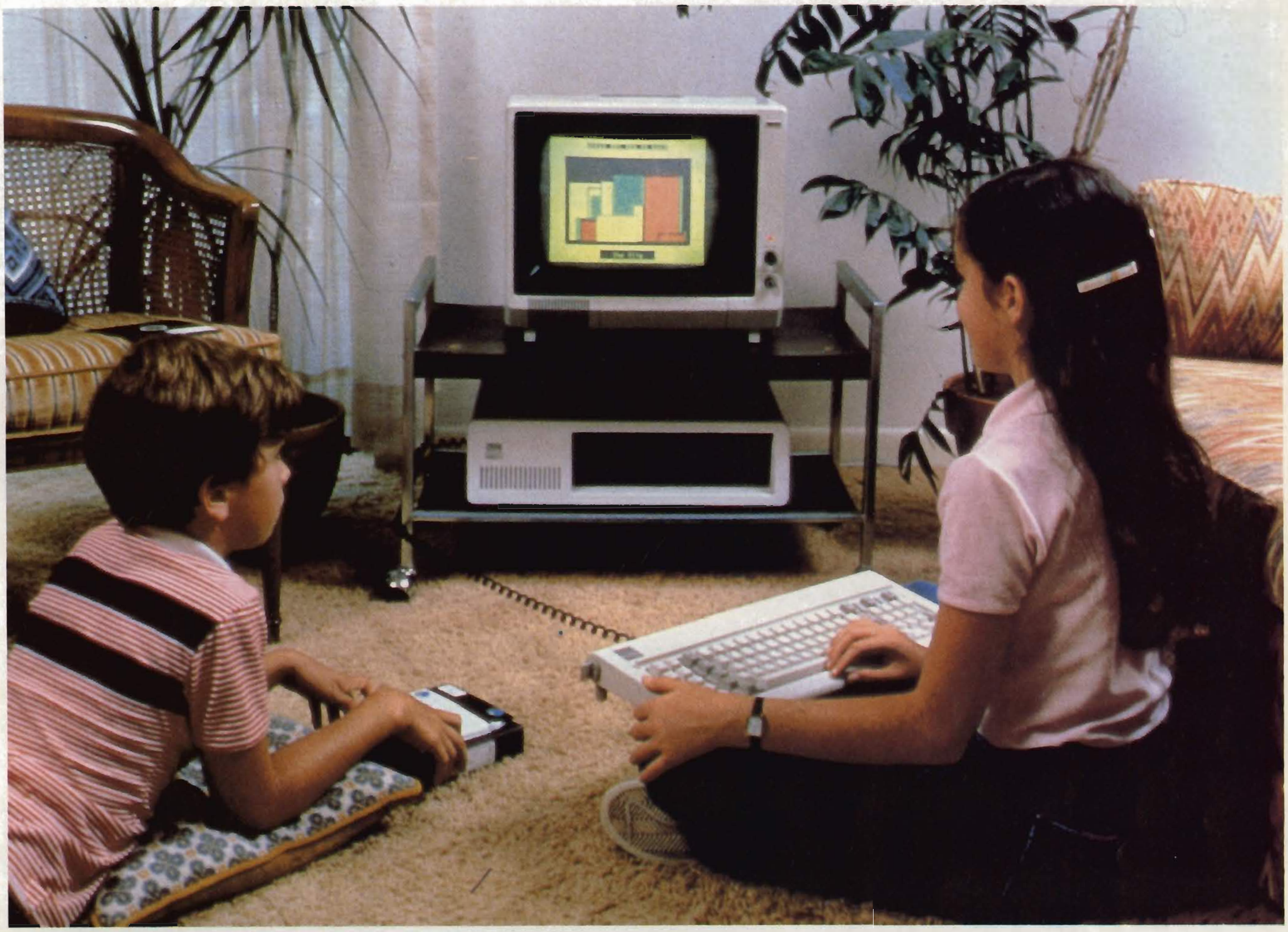
Thus, to review, the general term software includes information delivered by a punched card (or keyboard), information loaded when a system is turned on (operating system), information contained in silicon chips (firmware) plus information stored in microprocessors.

DOWN TO BASICS

While it may not be true that "he who controls software rules the world," there are many different types available. Computer games, educational packages, computer languages, spread sheet programs, data base managers and special application programs for various activities and businesses are all abundant. However, the language BASIC is likely the most widely available microcomputer software program. There are actually many varieties, or dialects, but microcomputers ranging from the Z81 Timex Sinclair all the way to the $8000 Grid portable come with at least one.

In some cases, the BASIC is contained on one of your computer's silicon chips, or ROM (Read Only Memory). It's difficult (but not impossible) to alter or erase a ROM chip's contents, and thus equally difficult to lose BASIC. Another advantage of encoding the language on a chip is that it's immediately available whenever the computer is turned on. (In fact, some computers with BASIC in ROM, such as the Z81 Timex Sinclair, are actually BASIC programming machines, since everything must be done in BASIC.)

Actually, inscribing computer chips with software programs is a relatively recent development, simply because the technology for placing 2000 to 8000 instructions on anything the size of a pencil eraser is complex. In the future, with 256K memory



chips (256,000 bytes, or instructions) under development, we can look forward to having other popular programs, such as checkbook management, personal inventory control and electronic address books, built right into our home computers. In addition, facilities will undoubtedly be available for inscribing your own information onto ROM chips.

CASSETTES AND DISKS

Today, however, most software is either on tape cassettes or diskettes. When your microcomputer is turned on, it's functional, but there's very little it can do without instructions delivered to its memory. This is supplied by the software. The primary differences between the two main types, tape cassettes and diskettes, are speed and price. The latter are generally at least 10 times faster, and 10 times as expensive, as tape cassettes.

> "... why this excitement over software? ..."

To recap, software is delivered to a microcomputer system is three ways: through a ROM chip, tape cassette or diskette. There is, however, one further way: through the keyboard. Not only can programs be written and delivered first to the computer's computing part, then to a cassette or diskette, but data developed through your use of software can be immediately moved to a mass storage device.

TYPES OF SOFTWARE

Because of its versatility, BASIC is being packaged with virtually every microcomputer. Yet, there are many other types and subtypes of microcomputer software available.

Recreation: Smart money is betting that today's game machines (the Atari 400, for example) will soon be giving way to more general-purpose but equally inexpensive home computers, with the ability to play the currently available cartridges, as well as use more serious software. As for the games themselves, they're bound to get more exciting in several ways.

Languages: A number of languages other than BASIC are now marketed for many systems. COBOL and FORTRAN, perhaps the most famous, can be purchased for microcomputers with larger-than-average storage

> "... most software is on either tape cassettes or diskettes ..."

Photos By Perry Greenberg

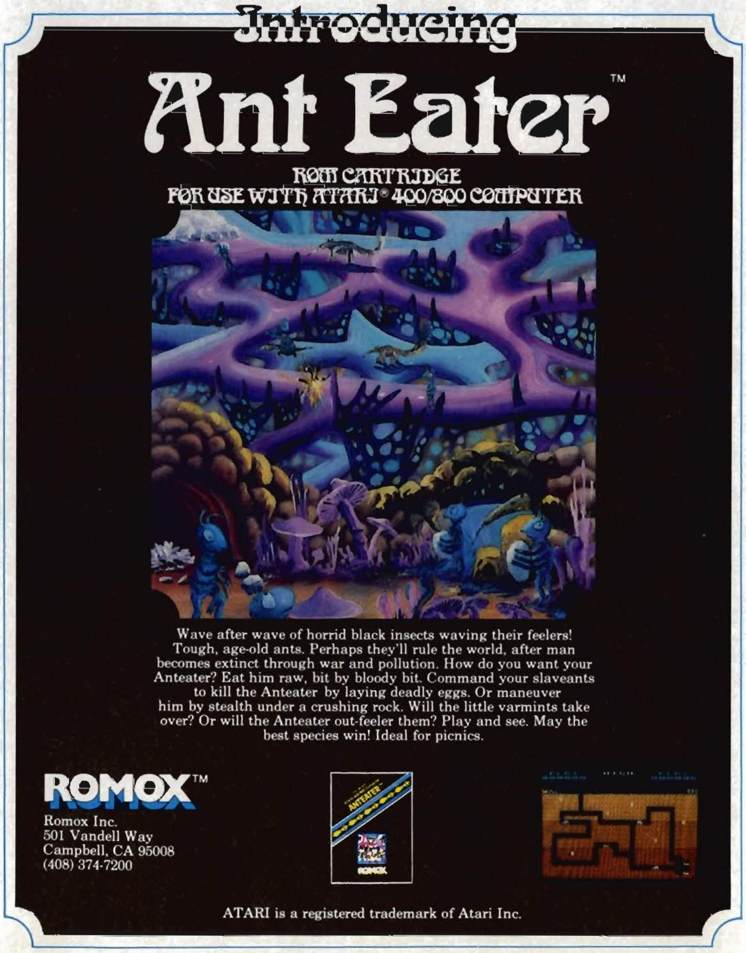
capabilities. PASCAL, very popular with microcomputer users, is also widely available, as are versions of C, Ada, FORTH and so on.

Spread sheets: VisiCalc, a versatile software program, has not only changed the way businessmen think about computers, but how they solve their professional problems. It's become popular because it rapidly provides a means for testing various financial hypotheses.

Word processing: The concept of being able to keep a permanent, computerized record of all correspondence, reports and any other written information is intriguing. Unfortunately, being able to print this information on command remains a somewhat elusive, definitely expensive proposition for home computers. However, for those with the need and/or money, micro word-processing systems are here: the Applewriter, TRS-80 Scriptset and, probably the most powerful such software, WordStar. Slightly cumbersome but definitely comprehensive, WordStar can also be used in conjunction with fully or partially integrated programs that handle data (DataStar), information (InfoStar), mailing (MailMerge), sorting (SuperSort) and spelling (SpellStar). WordStar works on all computers with the CP/M operating system, as well as on the IBM PC.

Data base managers: Even maintaining an address book on a tape cassette requires software instructions—a means of categorizing the data you want remembered (by last name, zip code, birthdate). Data base managers play this and more complex roles.

Other business tools: Although VisiCalc popularized the Apple computer, a rapidly growing number of software tools is probably equally valuable to the businessman. For example, financial modeling is at least as important as the spread sheet but,



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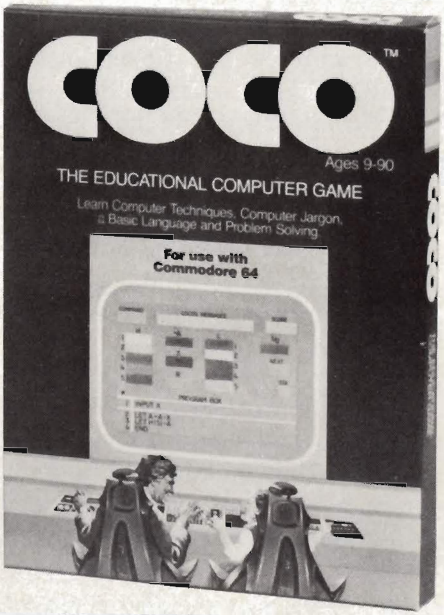
as of today, no planning program has captured VisiCalc's market.

SOFTWARE SOURCES

Most of the programs for your computer will probably come with the machine. Once it's sold in large numbers (over 10,000 units) or, if it uses an operating system already with large numbers of programs written for it (such as the CP/M operating system), independent programmers will be writing more. The best ways to learn about new program developments are through your dealer or in magazines focusing on home computers.

• The *Sword of Fargoal*,by Epyx,is a game that has you in pursuit of that magical weapon. You must transverse a bottomless dungeon and explore the many rooms and corridors; monsters and treasures lie waiting all along this mysterious maze. Available for the Commodore Vic-20 with 16K expander on cassette.

• ISA Software has Benji, probably the world's most famous dog, as the leading character for its new series of educational video games. The first of these games, Benji Saves the World, has him fighting off aliens while simultaneously teaching players about the solar system. The series is developed for use on the Commodore 64; versions for the Vic-20, Atari 400 and 800 will be released by midyear.


COCO™
Ages 9-90
THE EDUCATIONAL COMPUTER GAME
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For use with Commodore 64

• *Coco*, another ISA entry, teaches basic programming and how a computer works in an easy, fun way. The game comes complete with a 64-page instruction manual, cassette tape, diskette and joystick port adapter. (A cassette recorder or diskette drive is required.) Available for the Commodore 64 and Atari 800.

• ISA will also be making *Coco 2*, which will allow players to design and play their own video games without having any previous knowledge of computers. It will be available for the Vic-20 (16K memory) and Commodore 64 soon.

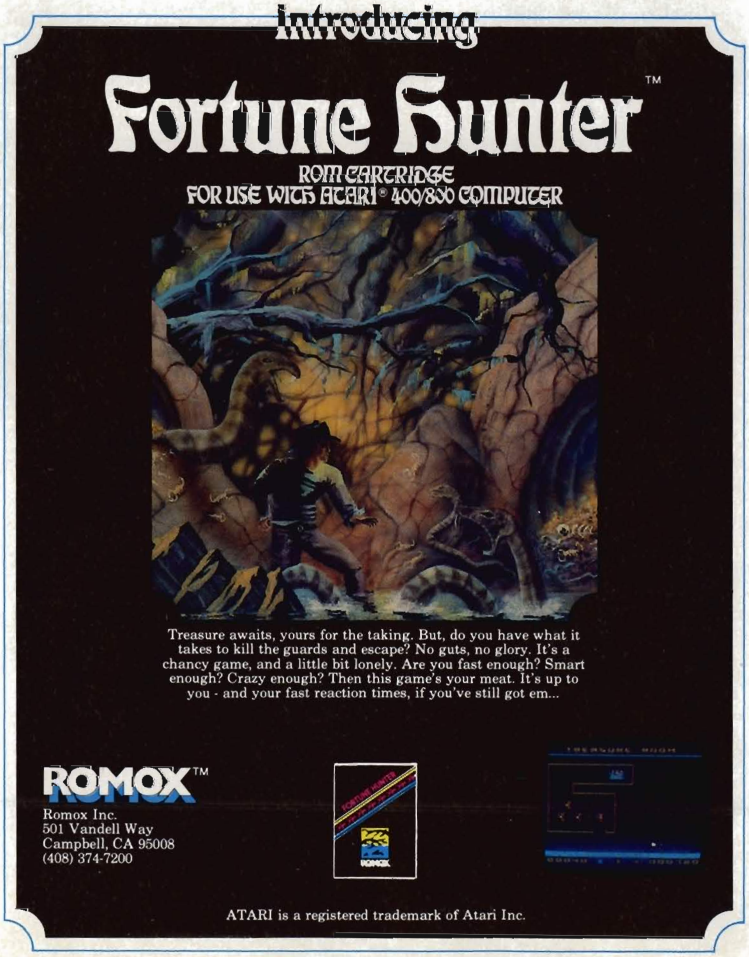
• *Apple Panic*,by Ben Serki,(Atari and IBM versions by Olaf Lubeck) is a game that has you scampering about a multi-tiered playing field connected by ladders. Giant, malevolent man-eating apples pursue you as you fight back by laying traps for them. This arcade-type game is available for the Apple II/II+ (48K disk) and is keyboard-controlled.

• In *Star Blazer*, by Tony Suzuki, you're piloting a highly maneuverable jet fighter. Your job is to destroy enemy installations while avoiding tanks, jets, heat-seeking missiles, explosive balloons and fuel-guzzling bluebirds. Joystick- or keyboard-controlled, it's for the Apple II/II+ (48K disk).

• *Stellar Shuttle*, by Matt Rutter, is an arcade-type game with you at the controls of a shuttle craft involved in a mission of mercy: to rescue refugees on the planet Ttam. However, the mission is fraught with perils, as you must maneuver your craft through asteroids to reach narrow landing wells to load up your craft with survivors. Deadly dragons try to devour the helpless Ttamians. Available for the Atari 400/800 only, it's joystick-controlled (16K cassette/32K disk).

• Mindware Inc. has developed a series of quick-loading software programs for the Timex TS-1000 and Sinclair ZX81 personal computers. There are six business titles: an electronic spread sheet, data base, management, word processing, inventory control, forecasting/graphs and a video slide show. They also manufacture two engineering programs—critical path analysis and equation solving—plus three advanced programming aids: the programmer's tool kit, screen display and a monitor.

• Mindware also has nine games available for the Timex: *Gulp*, *Laby-*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- Scholastic, Inc. is launching a new line of software, *Wizware*, for children 8 to 14. All will be on disk and cassette for the Apple II+, Atari 800/400, TI 99/4A and Vic-20 computers. The programs include *Microzine*, a computer magazine for children that allows them the opportunity to read features and participate in designing them. They can also program the outcome of stories and simulate activities such as riding in a hot-air balloon. They can even interview a popular personality with their own questions

- *Turtle Tracks*, also from Scholastic, teaches the fundamentals of computer programming to children. They control the movement of a turtle, commanding it to select colors plus draw lines, circles and other shapes. Pictures can be stored in the memory and called into play later to build more complex projects. The program prepares them for the study of BASIC, LOGO and other languages. Turtle Tracks comes with a handbook, sample problems and suggestions for parents and teachers.

- *Nerd Alert*, by Scholastic, is an action game, in which you control Jocko. His mission is to prevent a legion of Nerds from taking over Nerd High.

- Synapse Software's *Shadow World* has you at the controls of a Stinger Class Interceptor, which you're piloting on behalf of Free Planets. It's for the Atari 400/800 with 16K (disk, cassette or cartridge) and joystick.

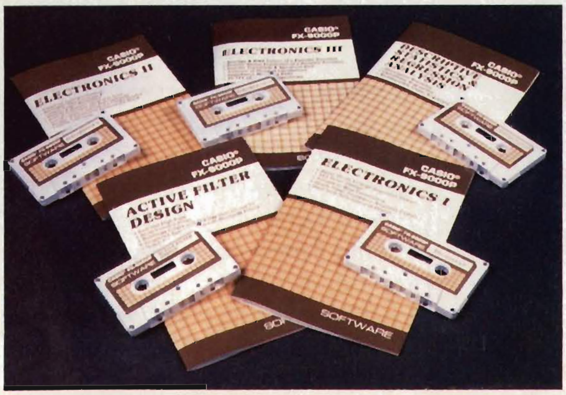
- *Dodge Racer*, by Synapse, is an arcade-style game in which you're driving a race car. In front of you are six lanes of white dots that you have to scoop up. But, as you speed along, collecting points, the computer's maniacal jam cars hop lanes, trying to crash head-on with your racer. You must avoid them but, as the game progresses, the action speeds up. This game is for the Atari 400 or 800 and features 16K memory for cassette and cartridge; 24K for disk.

- In *Claim Jumper*, by Synapse, you're a prospector who has located a huge gold nugget. But, before you can retrieve it, a greedy claim jumper makes off with it and is headed for the assay office to turn it into cash. You must stop him. To help you, you can place rattlesnakes in his path, but do avoid the deadly tumbleweed. It's for the Atari 800/400 with 16K memory and one or two joysticks.

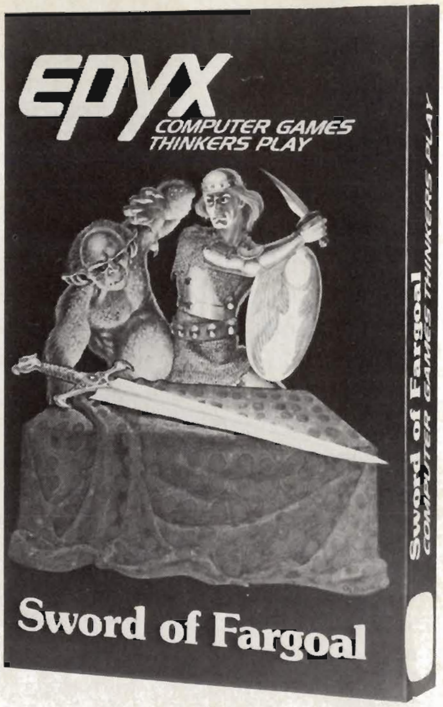
- *Jumbo Jet Pilot*, by Thorn EMI, has you at the controls of a 747. This flight-simulation game provides you with instrumentation and a view through the cockpit window; the idea of the game is to navigate from your home airport to your destination and land safely. You can also test your abilities as a pilot, and the computer will score you. It's available as a cartridge for the Atari 400/800.

- *River Rescue*, by Thorn EMI, is an arcade-type game that has you as the captain of a powerful riverboat. Your assignment is to navigate your boat through the treacherous waters of the world's most dangerous river, while shooting and avoiding obstacles, to rescue three explorers lost in the jungle. You're guided to them by the weak radio transmission they're sending. It's available on cartridge for the Vic-20.

- Tronix's *Kid Grid* is an arcade-type video game. You run around a grid, connecting dots, while eluding four nasty pursuers. It's available on cassette or diskette, 16K for the Atari 400/800.



> **". . . computers were capable of performing specialized tasks . . ."**



- *Swarm*, by Tronix, is another arcade-type video game. Here, you're attacked from all directions by deadly wasps and other insect-like monsters. Quick movement of your joystick and accurate firing are your only defenses as you rack up points. This cassette is for the Vic-20.

- *Sidewinder*, by Tronix, has you at the controls of a futuristic helicopter gunship. You have to outmaneuver bombs as you attempt to destroy alien Oblitojets. It's on cassette for the Vic-20.

- Broderbund has a host of games available for the Atari, Apple, Vic-20 and IBM-PC computers. *Serpentine*, by David Snider, is an arcade-style maze game involving snakes at war with one another and multiple levels of play. The snakes also lay eggs and fight viciously to protect their young. It's available for the Apple II/II+ (48K disk), keyboard- or joystick-controlled, and Atari 400/800, joystick-controlled (8K cartridge, 16K cassette or 24K disk).

- *Choplifter*, by Dan Gorlin, has you at the controls of a helicopter gunship. Your job is to rescue comrades trapped behind enemy lines, while battling enemy fighters and air mines above, tank fire and air-to-ground missiles below. For the Apple II/II+ (48K disk), it requires a joystick with two buttons; for the Atari 400/800, it's again joystick-controlled (16K cartridge or 48K disk).

- The *Arcade Machine*, by Chris Jochumson and Doug Carlston, allows

APPLE PANIC
GENETIC DR
STELLAR SHUT
LABYRINT
A.E
CHOPLIFTER!
Broderbund Software

you to create your own arcade game without programming knowledge. You can even design your own monsters or choose from a selection provided. Also included are automatic high scoring and arcade-quality sound effects and explosions. It requires the Apple II+ or Apple II with Applesoft in ROM or RAM and a 16-sector controller (48K disk).

- *Datasoft* has a license to produce computer games based on the legendary martial arts star Bruce Lee, who died mysteriously in 1974. In agreement with Ziv International, they will be out in mid-1983.

- *Monster Maze*, by Epyx, has you trapped in a maze, being pursued by mutant monstrosities. Your job is to collect as many gold bars as you can while eluding and destroying them. Your weapons are an overview map plus power vitamins. It's for the Apple with Applesoft in ROM, 48K disk; TRS-80, cassette 16K and disk 32K; Atari 400 and 800, ROM cartridge, joystick.

- In *Alien Garden*, by Epyx, you're a cosmic creature whose job it is to dodge in and out of mysterious crystals. You must find and eat the ones that are edible, while stinging and avoiding the deadly ones. It's available for the Atari 400 and 800, ROM cartridge with joystick.

- Softsync, Inc. makes computer software for the Timex/Sinclair 1000/ZX81. Among its entries are *Red Alert*, an arcade-type game, in which you must pilot a spaceship over treacherous mountains and drop bombs, while battling oncoming aliens who swoop down and fire rockets at you (16K memory is required).

- *Quest for the Holy Grail* is an adventure program. You're a famed daredevil archeologist professor who lands on a volcanic island where the Holy Grail is supposed to be hidden. You must find it before the volcano erupts, despite perilous obstacles like jungles, hungry natives, Nazis and apes (16K memory is required).

- Another adventure game by Softsync is *The Elusive Mr. Big*. You're a detective on the prowl in the seediest parts of a great metropolis, searching for the underworld leader Mr. Big. Both Holy Grail and Mr. Big have a special feature that rearranges the stories' details every time the programs are loaded, so the player confronts different problems each time.

- In *Gridrunner*, by HES, you're at the controls of a fighter spacecraft. Your job is to protect an orbiting space station from the enemy. It's available in cartridge form for the Vic-20 and Commodore 64, joystick required.

The Official
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COMPUTER SOFTWARE

- HES's *Retro Ball* is a computerized version of air hockey. You use the joystick to propel a lightning-fast puck across the screen. It can be played against the computer or another player, and is available in cartridge form for the Commodore 64.

- *Astro 1000*, by HES, is an adaptation of that arcade game for the Timex 1000. There are nine levels of play and three types of enemies to confront.

- In *Shamus*, by HES, you're a detective of the future on the trail of the deadly shadow, a deadly villain. There are two levels of play and 20 rooms containing vicious henchmen. It's available on cartridge for the Vic-20.

- *Zaxxon*, the hit arcade game by Sega, will be released shortly by Datasoft in both diskette and cassette for Atari, Radio Shack and Apple computers. Zaxxon is a flight game involving the attack of an enemy fortress by the player's ship while avoiding missiles and collisions.

- *Moon Shuttle*, another arcade hit, will be released soon by Datasoft on both diskette and cassette for Atari, Apple and Radio Shack computers. It involves piloting your craft through space, avoiding perilous obstacles along the way, such as meteors, bomb launchers and spinning rockets. The enemy Prince of Darkness's forces treacherously multiply just as you think you've reached safety.

- Finally, *Dallas*, the long-running hit TV series, will be made into a series of computer games by Datasoft in mid-1983.—PERRY GREENBERG

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EHC's SPECIAL COMPUTER BUYER'S GUIDE

Which computer is right for your own special needs? It's a question plaguing most of us when we decide to purchase our first personal computer. And with more developments and improvements happening almost daily, the process doesn't appear to be getting any simpler. However, there's still a way to make some sense between the models available, just by comparing different capabilities and features. This is the starting point—getting familiar with what's out there—and, in the coming months, EHC will be taking a closer look at these, as well as other, home computers in the hope of keeping the information clear, concise and, of course, easy to understand.

COMMODORE
64

Having broken out with the VIC-20, which revolutionized and simplified the entire concept of personal computing, Commodore (The Meadows, 487 Devon Park Road, Wayne, Pa. 19087, 215-687-9750) is ready to strike again with its model 64, so named for its 64K computing capability. Physically resembling its lower-priced counterpart, the Commodore 64 can use VIC-20 peripherals, while also going far beyond the other's operational range. Able to use a Z80 add-on processor board to run CP/M programs, the 64 also features a PET emulator for tapping a wider choice of software, with 39K of RAM being user-accessible for BASIC programs and 52K for machine language programs. There are three-dimensional-style color game graphics and a 40 column-by-25 line display with 255 combinations of border/background colors. In addition, the Commodore 64 features music synthesis via a Sound Interface Device, which produces three independent voices and four sound waveforms. (About $600.)

monitor ///
apple IIe
Disk II

APPLE IIe

One of the true success stories of our time, in six short years Apple (10260 Bandley Drive, Cupertino, Calif. 95014, 408-996-1010) has had an incredible impact on the overall awareness and acceptance of home computers in general. Not surprisingly, the innovations continue with the addition of the Apple IIe to a growing product line. An upgraded version of the popular Apple II, this newest creation includes 64K of random access memory, which can be expanded by an additional 64K through the use of a low-cost plug-in card allowing you to run more sophisticated programs.

The Apple IIe offers an improved logic board and case design, and will accept an 80-column card for text editing. In addition, eight expansion slots have been built into the typewriter-sized computer as well as self-test diagnostics, all detailed and explained in a full-color owner's manual.

(The Apple IIe is about $1,395; with Apple also offering a complete "Starter System" package including the Apple IIe computer, the Disk II floppy disk drive with controller card, 12-inch monitor with stand and the Apple 80-column card, all for about $1,995.)

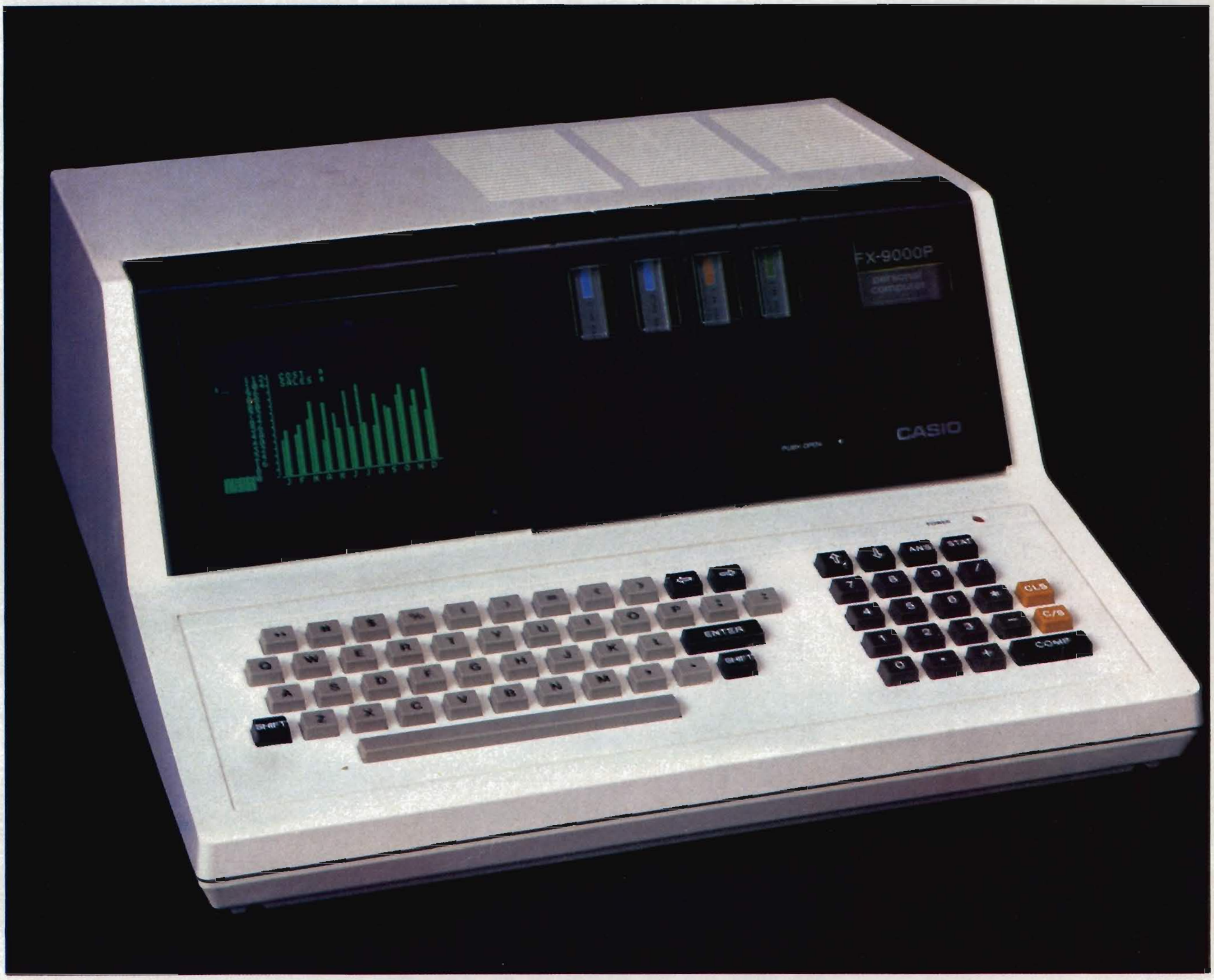
ATARI 1200XL

Having developed and expanded the scope of arcade video games, Atari (1265 Borregas Avenue, P.O. Box 427, Sunnyvale, Calif. 94086, 408-745-2000) then set its sights on bringing the action home via the highly successful 2600 VCS and the more advanced 5200. However, there was still another area to tap, and Atari moved into home computers with the introduction of the model 400 and 800, which were more than just game playing systems.

Now comes the next step in product evolution with the release of the model 1200XL. Sleekly styled, with a keyboard that includes 12 user-programmable function keys for simplified operation, as well as the capability to shift over to an international character set, the 1200XL offers 64,000 bits of built-in, random access memory and one touch cursor control. In addition, the unit can work with either a television set or monitor and uses the same software now available for the other two models in the Atari line-up, including entertainment, education, personal development and home management.

Three new hardware peripherals have also been unveiled specifically for the Atari 1200XL. The model 1010 Program Recorder is a cassette memory system using standard audio tapes for storing and loading programs and data; the model 1025 Printer features 80-columns of dot-matrix characters printed at 40 characters per second, with design that allows you to use single sheets, fan-folded paper or rolled paper; the model 1020 40-column Color Printer/Plotter offers four-color text and graphics to further round out the total system.

(The Atari 1200XL is about $899; 1010 Program Recorder about $100; 1025 Printer about $549; and 1020 Color Printer/Plotter about $300.)



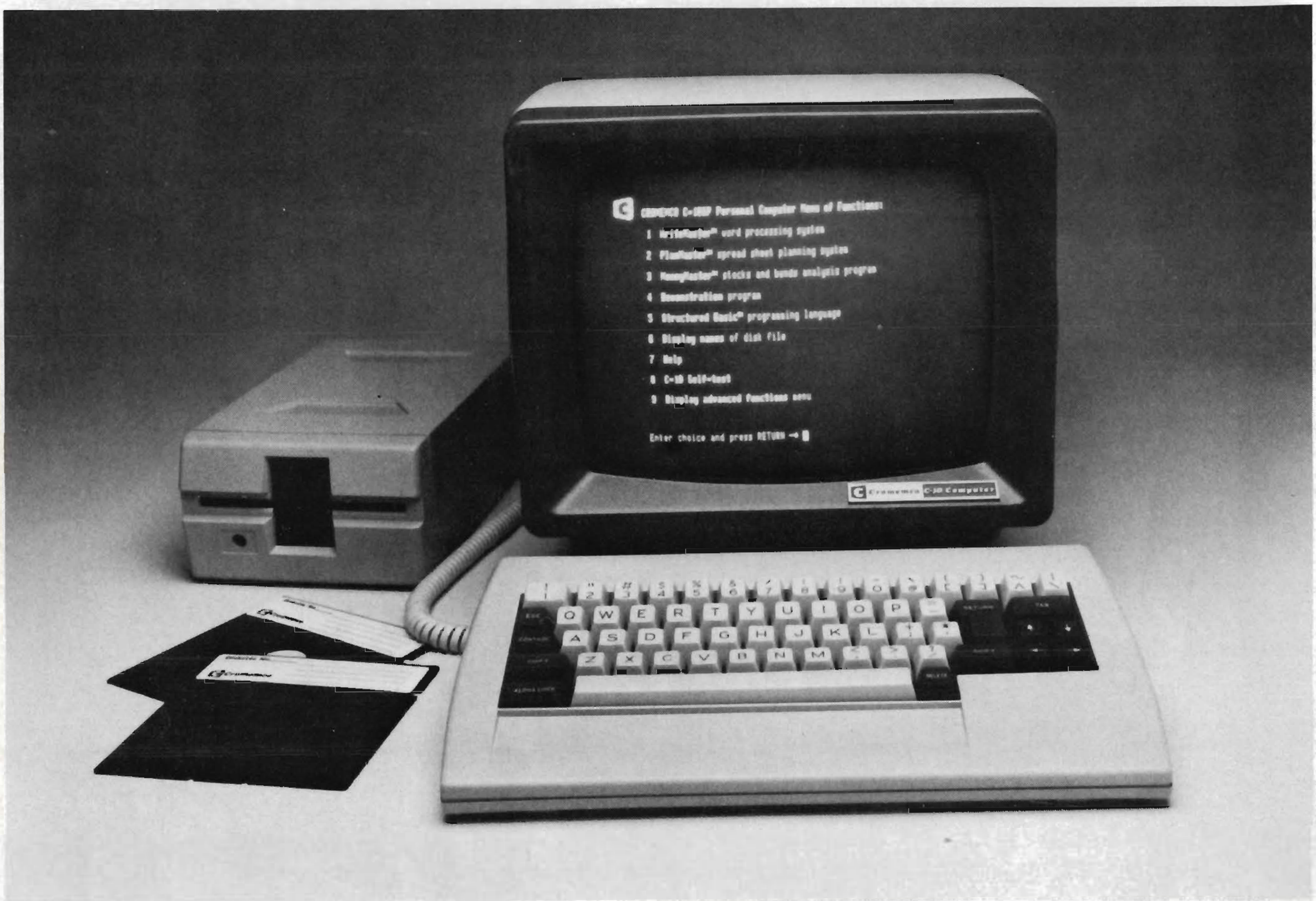
CASIO FX-9000P

Probably better known for their personal electronics products, not the least of which is their recently introduced "Casiovision," the world's smallest pocket television weighing only 12.35 ounces with a 2¾-inch screen, Casio (15 Gardner Road, Fairfield, N.J. 07006, 201-575-7400) has entered the world of computers with a Z80A microprocessor based unit featuring 12K bytes of read only memory and 4K-bytes of random access memory, with the latter able to be expanded to 32K-bytes. In fact, two RAM packages are available to better tailor the main unit to fit your individual needs.

The model FX-9000P offers a 67 key typewriter and calculator style keyboard as well as a built-in 5.5 inch green CRT (cathode-ray tube video monitor) for high resolution graphics functions which can include a variety of patterns, tables and graphs, such as curved lines, bars and circles, with precision and clarity.

Equipped with CA-BASIC (CASIO BASIC), the FX-9000P uses an extended version of the standard conversion type, problem-solving BASIC language with easy-to-understand grammar and a versatile command group. In addition, there are a full range of options available for expanding the capability of the basic system via a cassette-type interface, clock, alarm and calendar logic with battery backup, character printer, graphics printer and a disk drive interface.

(The Casio FX-9000P is about $2,200.)



CROMEMCO C-10 Super Pak (SP)

Taking an already solid system which could easily stand on its own, Cromemco (280 Bernardo Avenue, Mountain View, Calif. 94043, 415-964-7400) has added a bit of this and a bit of that for a totally enhanced package that should satisfy almost any home computer need.

The resulting C-10 Super Pak is based around a high speed Z-80A microprocessor with 64K bytes of random access memory and 24K bytes of read only memory with a high resolution 12-inch CRT monitor featuring display capability of 80 characters per each of 25 lines. Functionally styled, the system incorporates a detachable, ergonomically designed keyboard with swivel/tilt mounted display of the monitor possible and also full cursor positioning.

The C-10 SP also includes a 5¼-inch disk drive with 390K capacity and three separate software packages which allow you to use not only a wide variety of Cromemco languages, but applications software such as BASIC, RATFOR, COBOL and FORTRAN as well.

(The Cromemco C-10 Super Pak is about $1,785 complete with disk drive, CRT and software.)

EAGLE 1600 SERIES

Form follows function with Eagle's (983 University Avenue, Building C, Los Gatos, Calif. 95030, 408-395-5005) new IBM-compatible 1600 Series system. Modularly designed with detachable keyboard, separate monitor and processor, the Eagle 1600 features 128K of random access memory, one megabyte of disk storage on a 5¼-inch floppy disk drive and 12.5 megabytes on a hard disk drive, while the internal memory is expandable to 512K.

The 105 key keyboard has been thoughtfuly laid out with 24 set aside for user definable functions in order to more fully simplify and speed operation. In addition, the 1600 comes complete with word processing and financial planning software packages. Eagle also offers a full line of peripheral options to further expand the basic system's capabilities.

(The Eagel 1600 with floppy and hard disk storage, monitor and keyboard, word processing and financial planning software is about $6,995.)

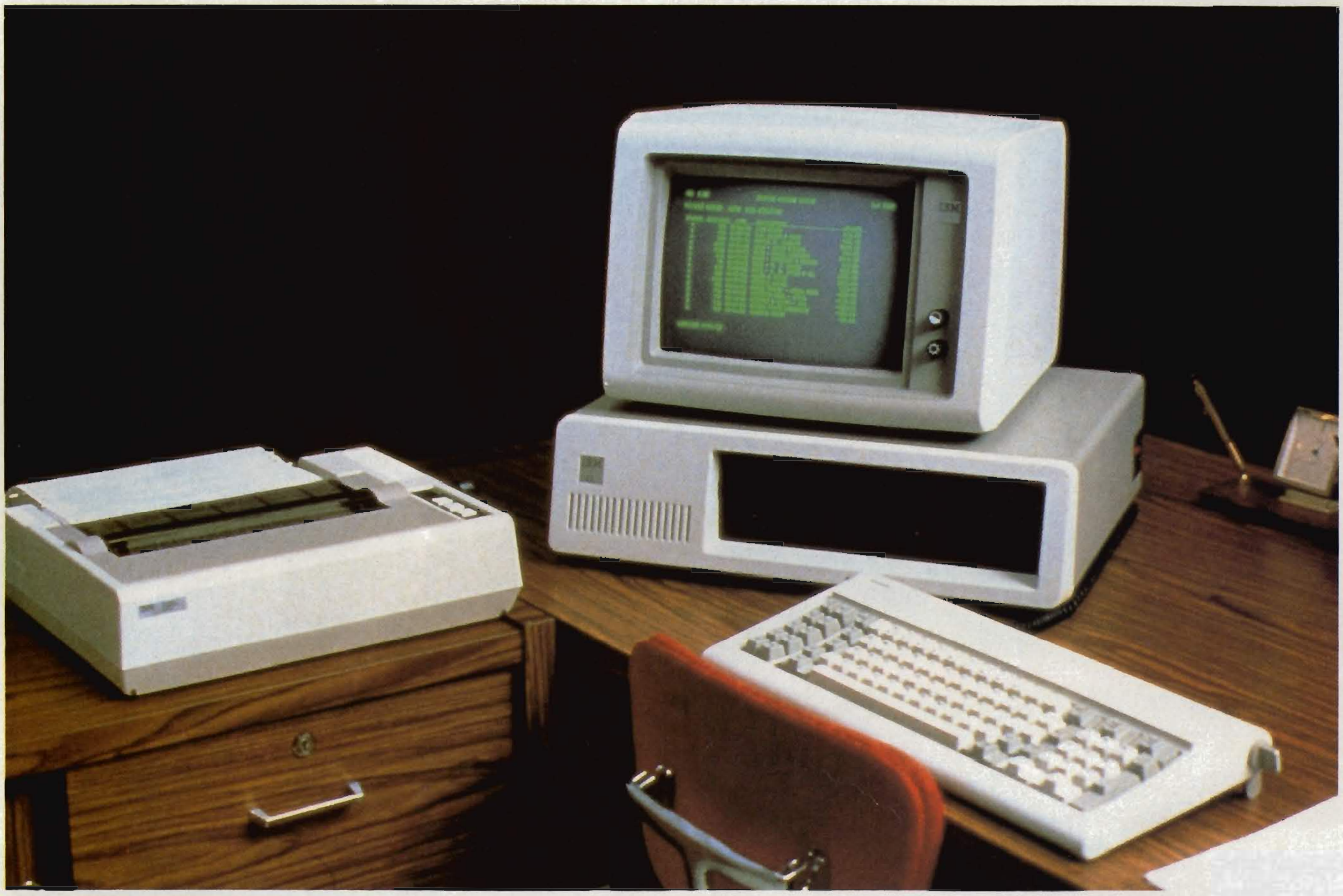
FRANKLIN ACE 1000

FRANKLIN ACE 1000

Rather than fight success, Franklin Computer Corporation (7030 Colonial Highway, Pennsauken, N.J. 08109, 609-488-1700) has chosen to improve upon it. Hardware- and software-compatible with the Apple II, the Franklin Ace 1000 offers some different features, including a typewriter-style 72-key keyboard with upper and lower case as well as 64K of RAM. In addition, the large memory permits the Ace 1000 to accomodate VisiCalc and CP/M-based programs. Although the Franklin Ace doesn't offer color graphics, it can still utilize many of the same programs available for the Apple II, while allowing for peripherals designed for the Apple to be used with the Ace. (About $1,330.)

HEWLETT-PACKARD HP-86

The new modularly designed HP-86 from Hewlett-Packard (1000 N.E. Circle Boulevard, Corvallis, Oregon 97330, 503-757-2000) consists of a microprocessor and alpha and numeric pad keyboard with 14 user-definable, special-function keys as well as four ports to add on a variety of peripherals and expand the power of the basic system. The HP-86 features a choice of 9- or 12-inch display monitors, a 270K byte capacity flexible-disk drive and an HP 8290B dot-matrix impact printer. Memory includes 128K bytes, of which 64K bytes are in user RAM, 48K bytes in operating system ROM, while 16K bytes of RAM are devoted to the display. (With monitor about $2,000; HP 82905B printer about $800.)



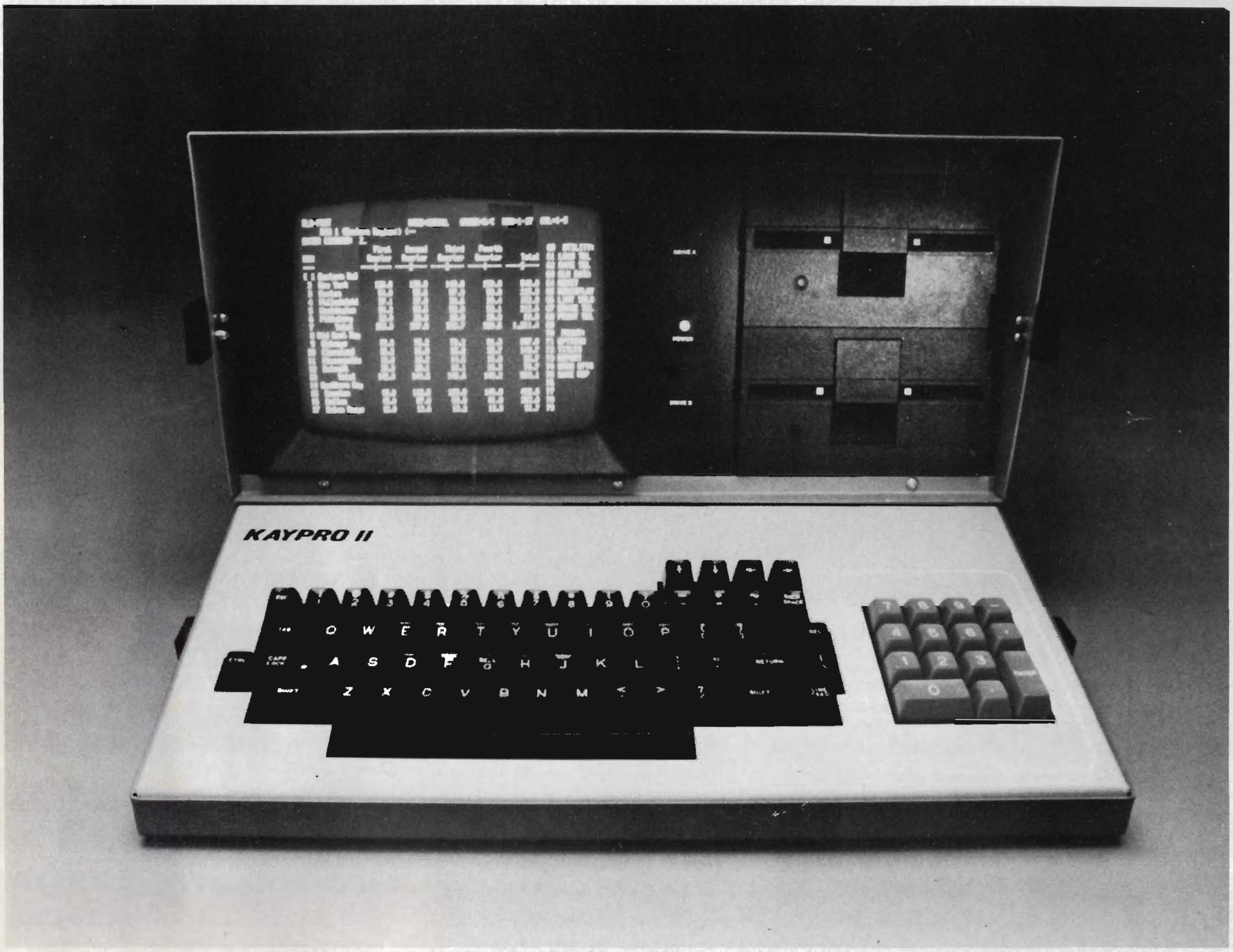
IBM
PERSONAL COMPUTER

Designed for the first time, as well as advanced, user, the IBM (P.O. Box 1328, Boca Raton, Fla. 33432, 305-998-6007) new Personal Computer features an 83-key adjustable keyboard, with a six-foot, coiled cable for flexibility, and up to 262,144 characters of user memory. There's a text system capable of displaying 256 characters in any of 16 foreground and 8 background colors, as well as the ability to display graphics in four colors. The compact-sized system utilizes a built-in speaker for audio and music applications and can be expanded via its own display, printer and auxiliary storge cassettes or diskettes. (The complete system pictured here, which includes monitor, dual disk drive, printer and keyboard, is about $4,385.)

INTERTEC DATA SYSTEMS
SUPERBRAIN

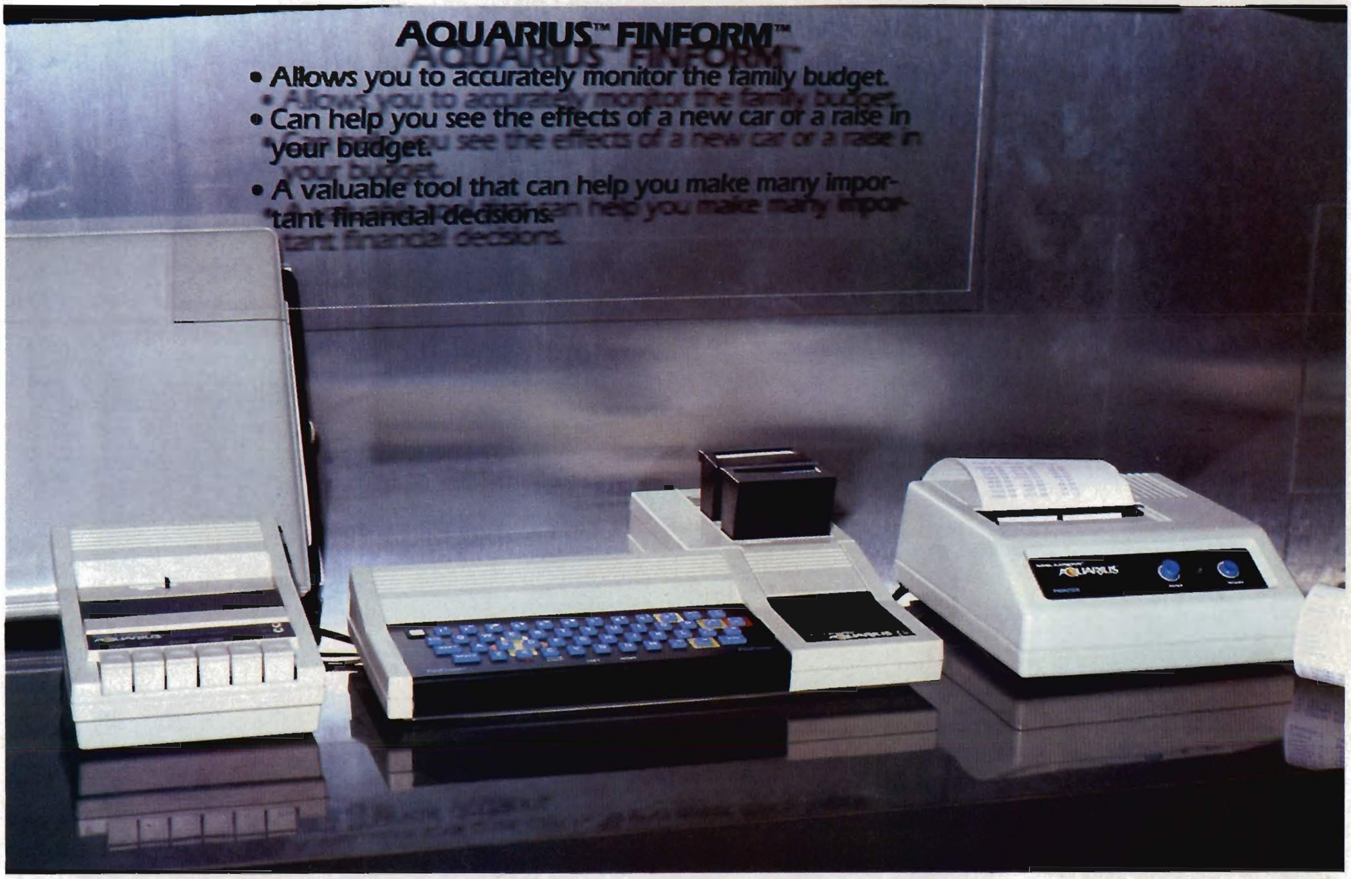
INTERTEC DATA SYSTEMS SUPERBRAIN II

A video computer system, the Superbrain II from Intertec Data Systems (2300 Broad River Road, Columbia, S.C. 29210, 803-798-9100) offers such standard features as two double density mini-floppy disks with up to 1½ megabytes of disk storage, 64K of internal memory, a CP/M Disk Operating System with a high-powered text editor, assembler, debugger and a disk formatter as well as Microsoft BASIC and even a battery-powered time/date software clock. The Superbrain II also incorporates a full ASCII keyboard with an 18-key numeric pad, non-glare 12-inch CRT and twin Z-80 microprocessors to enable efficient data transfers to any auxiliary peripherals. (About $2,495.)



KAYPRO II

A mid-size portable, Kaypro II (533 Stevens Avenue, Solana Beach, Calif. 92075, 619-755-1134) features a typewriter keyboard and calculator-like keypad for numerical work, as well as a 9-inch green screen monitor and two built-in disk drives. With 64K bytes of memory, the 26-pound Kaypro II can utilize an optional battery pack, while not diminishing on-screen capabilities of displaying up to 24 lines of 80 characters each. Connections are provided for a printer as well as tapping into telephone communications for information services. (About $1,795.)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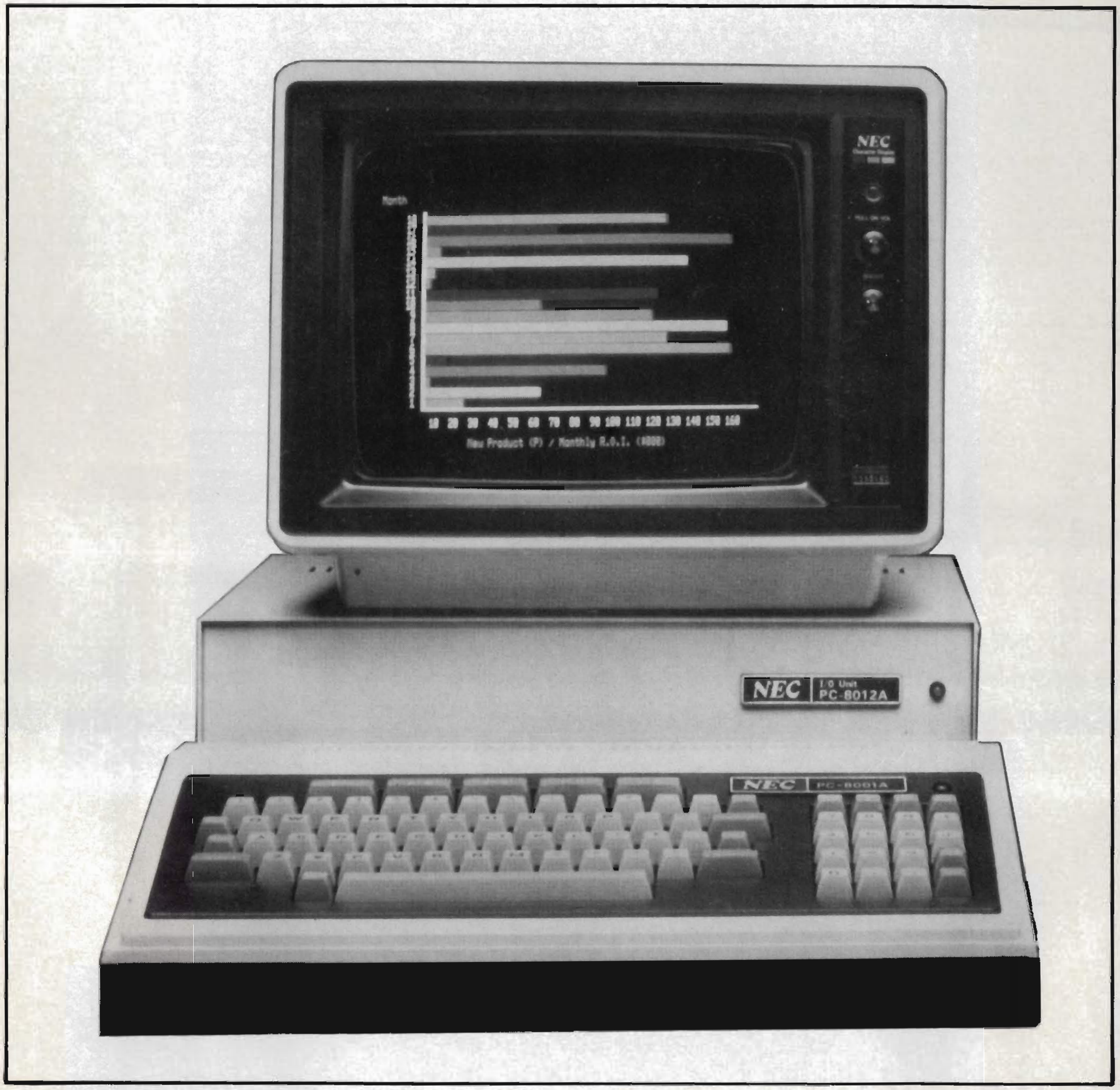
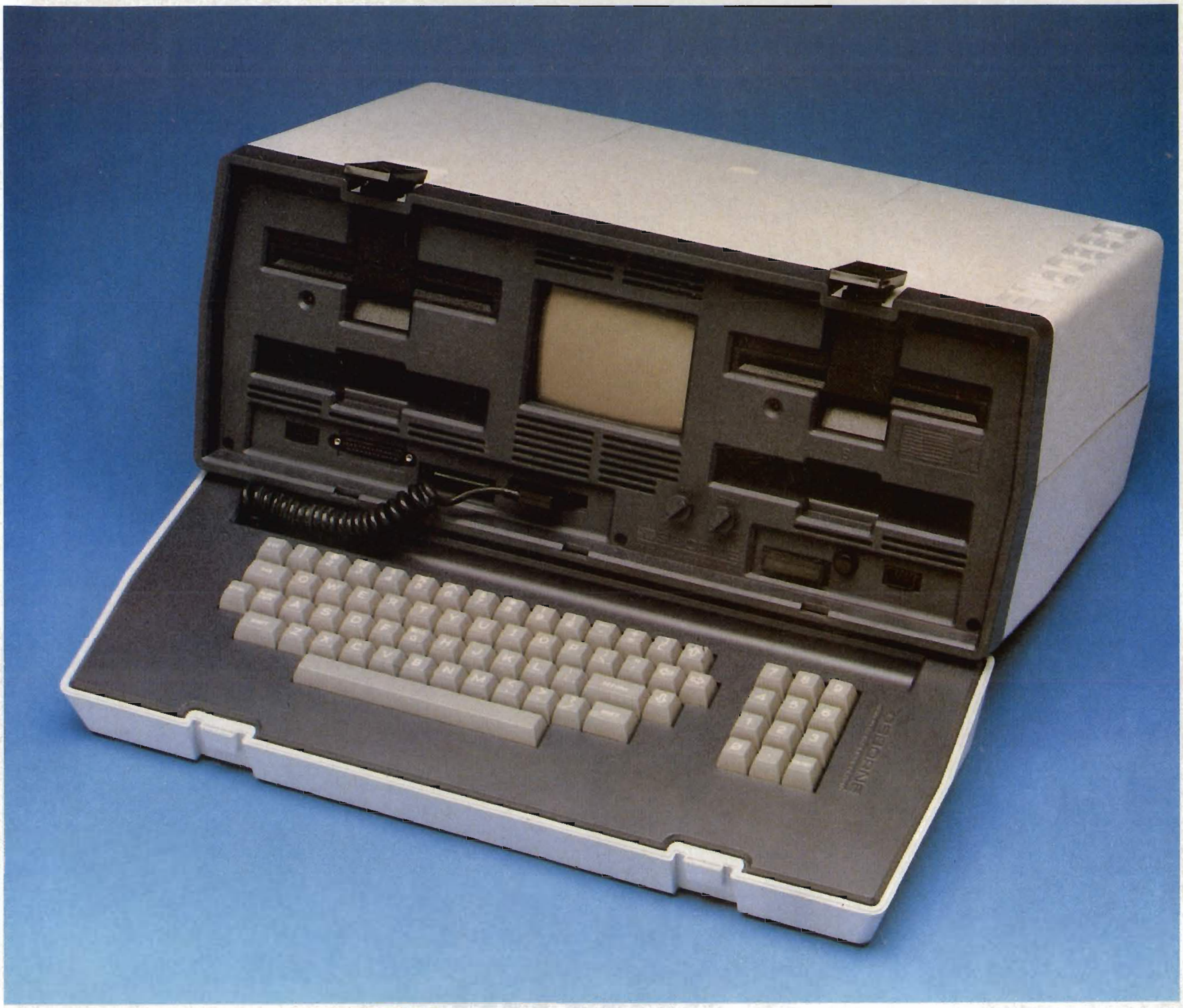
MATTEL AQUARIUS

Sleekly designed, Mattel's (5150 Rosecrans Avenue, Hawthorne, Calif. 90250, 213-978-5150) new home computer system is keyed for simplified operation. The Aquarius features a 49-digit keyboard with built-in 4K byte capacity that's expandable to 52K RAM. A 16-color display offers 256 different graphic characters, while the system utilizes Microsoft BASIC language as well as the ability to incorporate Aquarius LOGO via a single cartridge. Rounding out the Aquarius package is the availability of adding on a thermal printer, data recorder for program storage, and a mini-expander with hand controllers for software game play. (About $200.)



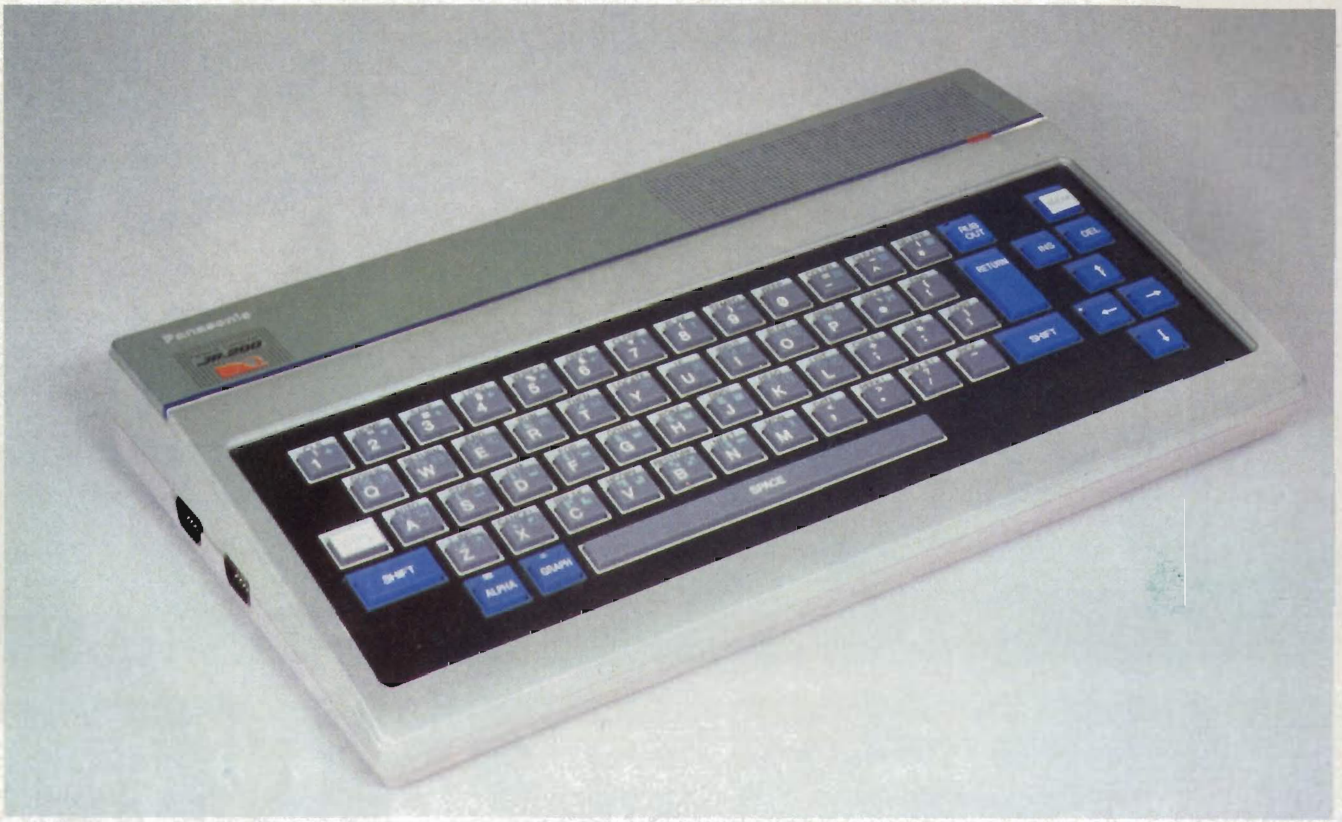
NEC PC-8001A

One of the models in NEC's (1401 Estes Avenue, Elk Grove Village, Ill. 60007, 312-228-5900) new personal computer series is the PC-8001A which features an 82-key keyboard with 5 user-programmable function keys and numeric keypad. The system provides 24K bytes of ROM and 32K bytes of RAM, with 64K RAM available via the model PC-8012 I/O unit. The PC-8001A delivers high resolution color graphics as well as 4-way cursor control right from the keyboard. A dual mini-disk drive unit expands the unit's capabilities. (About $2,650.)



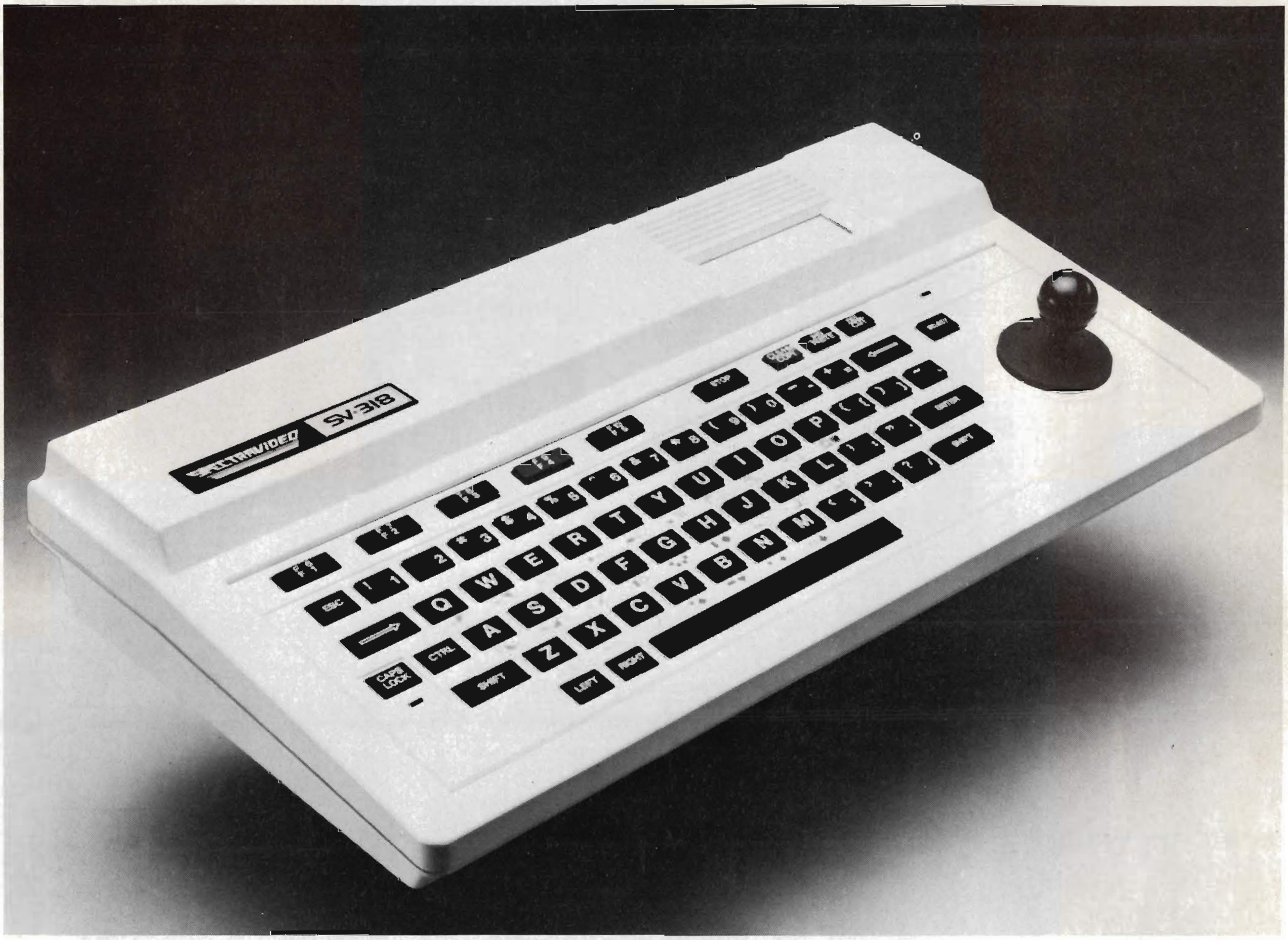
OSBORNE 1

Housed in its own plastic case, which snaps together to form a weather-resistant, 26-pound package, the Osborne 1 (26538 Danti Court, Hayward, Calif. 94545, 800-227-1617) is a full-featured, potent portable. Standard hardware includes a Z80A CPU with 64K RAM and dual floppy disk drives with 102K bytes storage each, a 5-inch CRT with 128-character line and automatic horizontal scrolling and standard typewriter keyboard with numeric, adding-machine keypad as well as cursor control keys. In addition, the Osborne 1 comes equipped with a variety of software such as Wordstar for word processing, SuperCalc an electronic spreadsheet, and MailMerge. (About $1,795.)



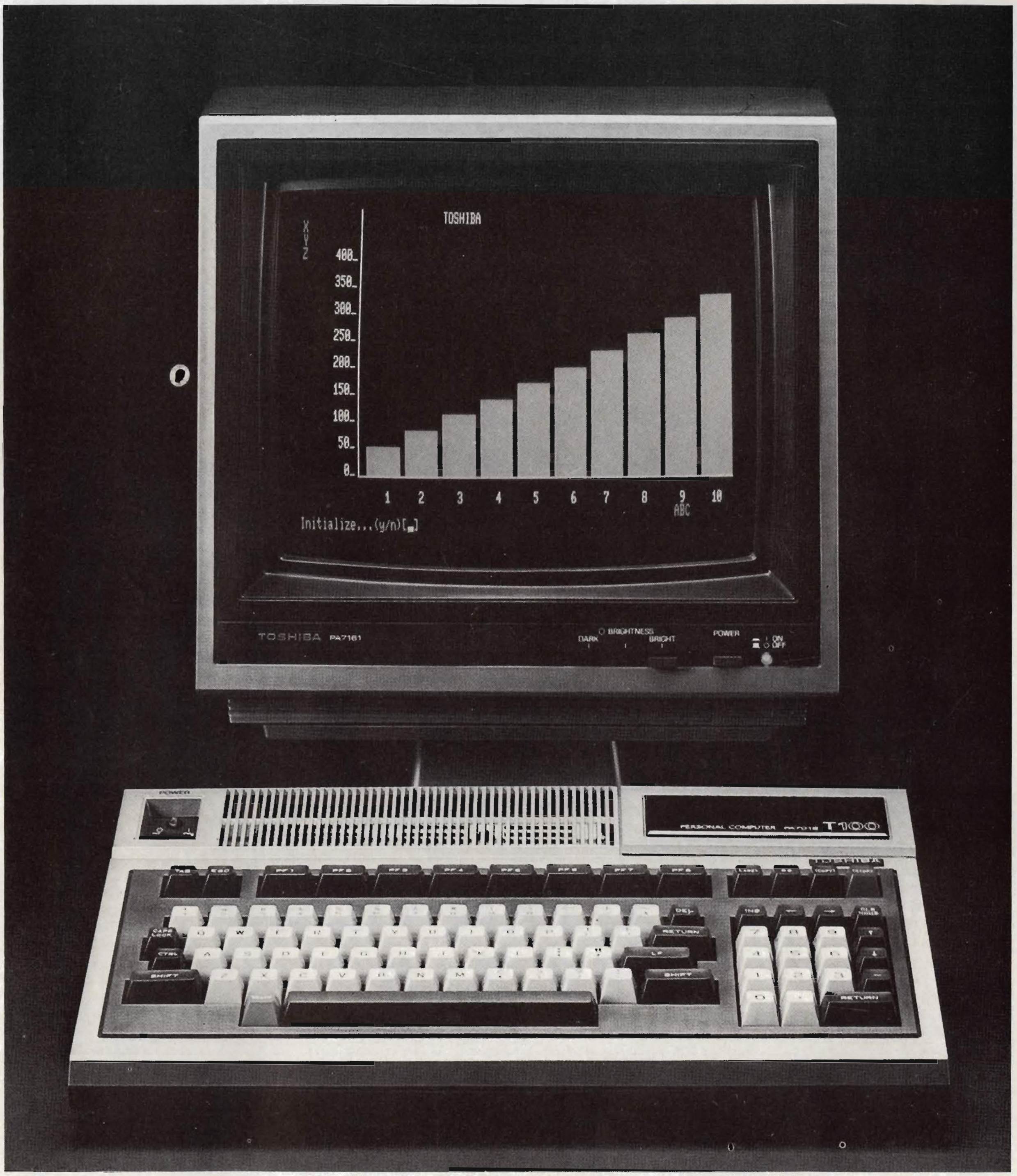
PANASONIC JR-200

Recently released, Panasonic's (One Panasonic Way, Secaucus, N.J. 07094, 201-348-7000) new JR-200 features built-in AC power supply, RF modulator, connections for cassette player,and printer interface,as well as Atari-compatible joysticks. The computer holds 32K useable RAM and 16K ROM and is capable of generating eight colors simultaneously when connected to a standard television or any composite- or RGB-type monitor. There's a multi-function keyboard which allows for the typing of numbers, letters in upper and lower case, semi-graphic symbols and also BASIC language commands. A variety of peripheral options are soon to be available to expand the JR-200's capabilities. (About $400.)



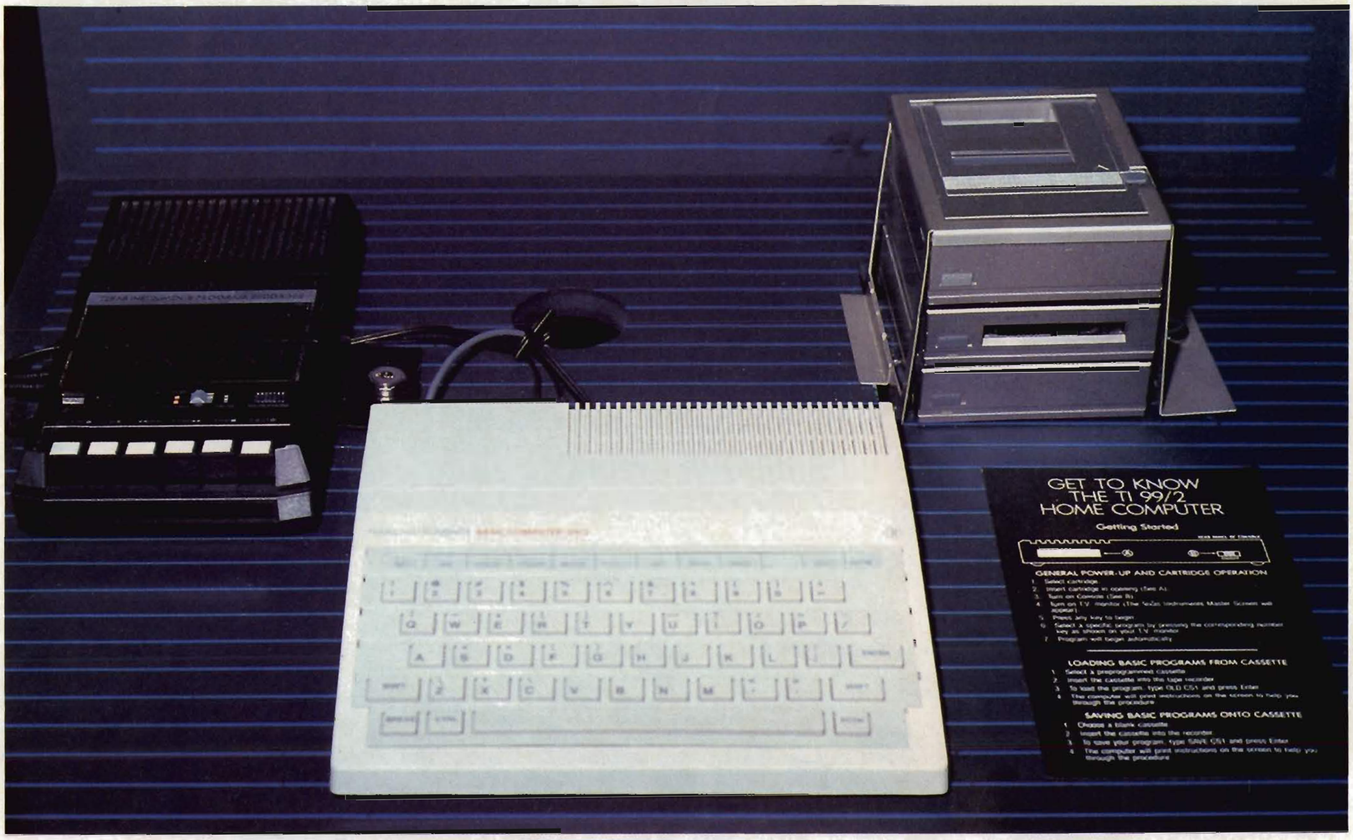
SPECTRA VIDEO
SV-318

Better known for their line-up of video game cartridges, Spectra Video (39 West 37th Street, New York, N.Y. 10018, 212-869-7911) has entered into the personal computer sweepstakes. The SV-318 utilizes a 71-key keyboard with upper and lower case alphabet, 52 graphics symbols, 10 user definable functions and the ability to generate 16 separate colors directly from the keyboard. In addition, the unit features built-in 32K ROM that's expandable to 96K; 32K RAM expandable to 144K; extended Microsoft BASIC interpreter and 80-column 2.2 CP/M and new CP/M Plus compatibility. The keyboard also provides a patented, built-in joystick and a separate game cartridge slot. (About $300.)


TOSHIBA
X
Y
Z
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10
ABC
Initialize...(y/n)[
TOSHIBA PA7161
BRIGHTNESS
DARK
BRIGHT
POWER
ON
OFF
POWER
PERSONAL COMPUTER
T100

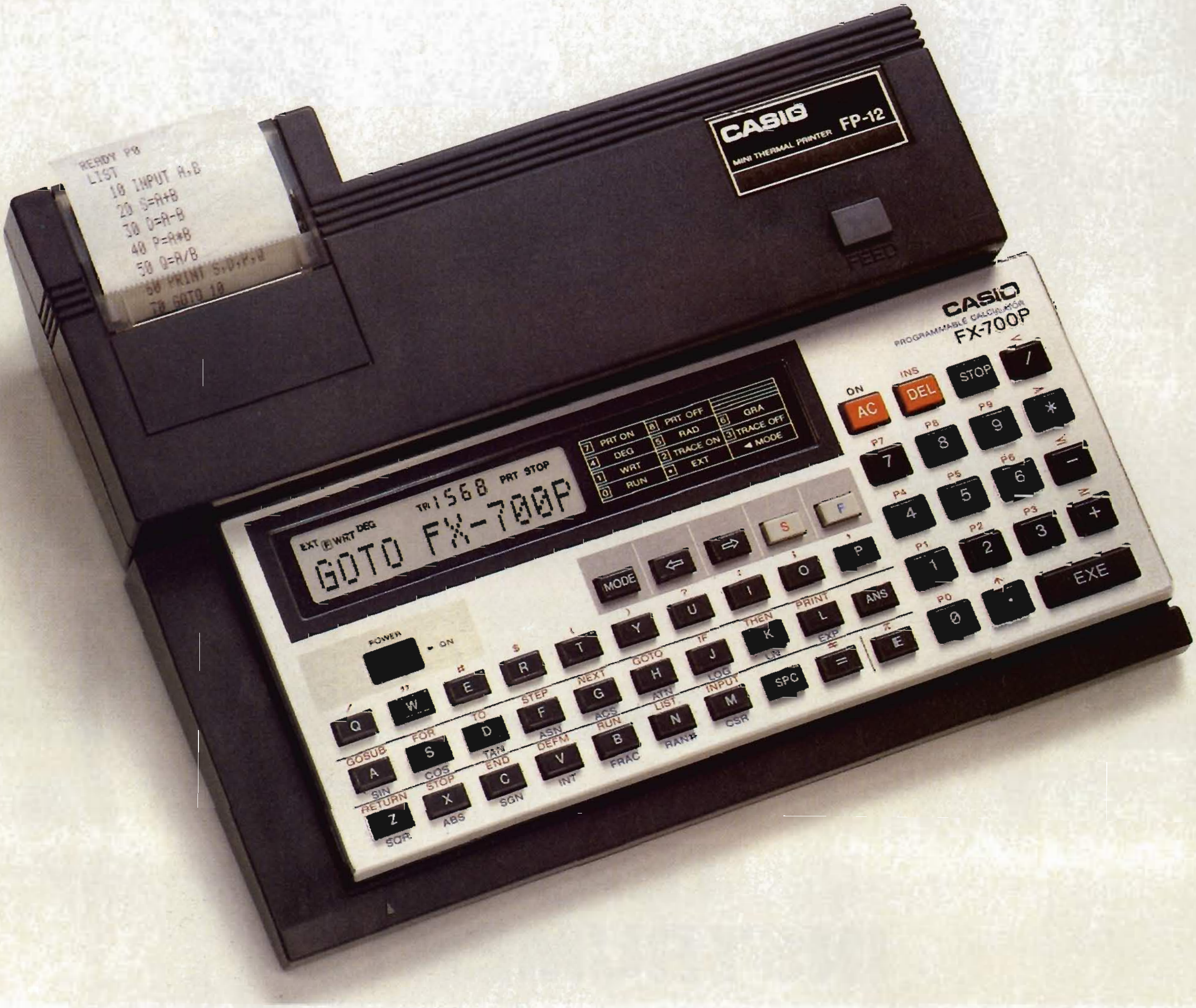
TOSHIBA T100

Straddling the thin line between small business and personal computers, Toshiba's (2441 Michelle Drive, Tustin, Calif. 92680, 714-730-5000) model T100 is built around a Z-80A processor and features a 90-key detached keyboard and five I/O screen options, including a flat panel liquid crystal display that can show eight lines of 80 characters each. A flexible and expandable system, the T100 is equipped with a 64K byte of main RAM, 32K byte of ROM for BASIC language and a 16K byte of video RAM as standard memory units. In addition, a ROM pack option with a maximum of 32K byte and a RAM pack option with 32K byte are available. (About $800; optional disk drive $1,300.)



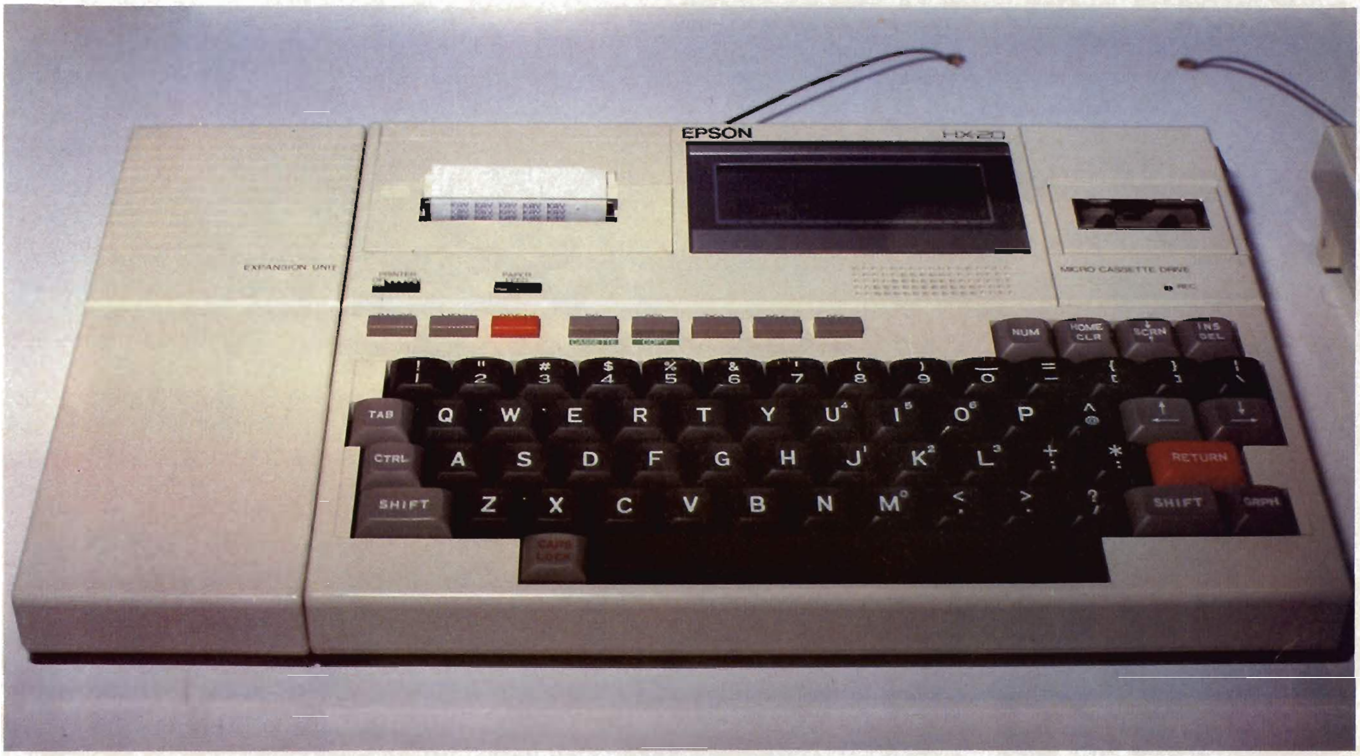
TEXAS INSTRUMENTS TI-99/2

Available this summer, Texas Instruments (P.O. Box 225012, Dallas, Texas 75265, 214-995-3741) is expanding its computer offerings with the TI-99/2. Featuring an elastomeric typewriter-like keyboard, the new model can play solid-state cartridges, as well as cassette-format software, and utilizes 4.2K bytes of built-in random access memory, which can be increased to a total of 36.2K bytes. There are monochrome display capability and a built-in RF modulator, with a video cable and·antenna switch available for connecting the computer to any television set. In addition, the TI-99/2 provides a Hex-bus peripheral-interface connector in the rear of the console for hooking up any of the optional components offered by TI, since the unit is compatible with both the hardware and software currently made for the company's other computer systems. (About $100.)


CASIO
MINI THERMAL PRINTER FP-12
FEED
CASIO
PROGRAMMABLE CALCULATOR FX-700P
GOTO FX-700P

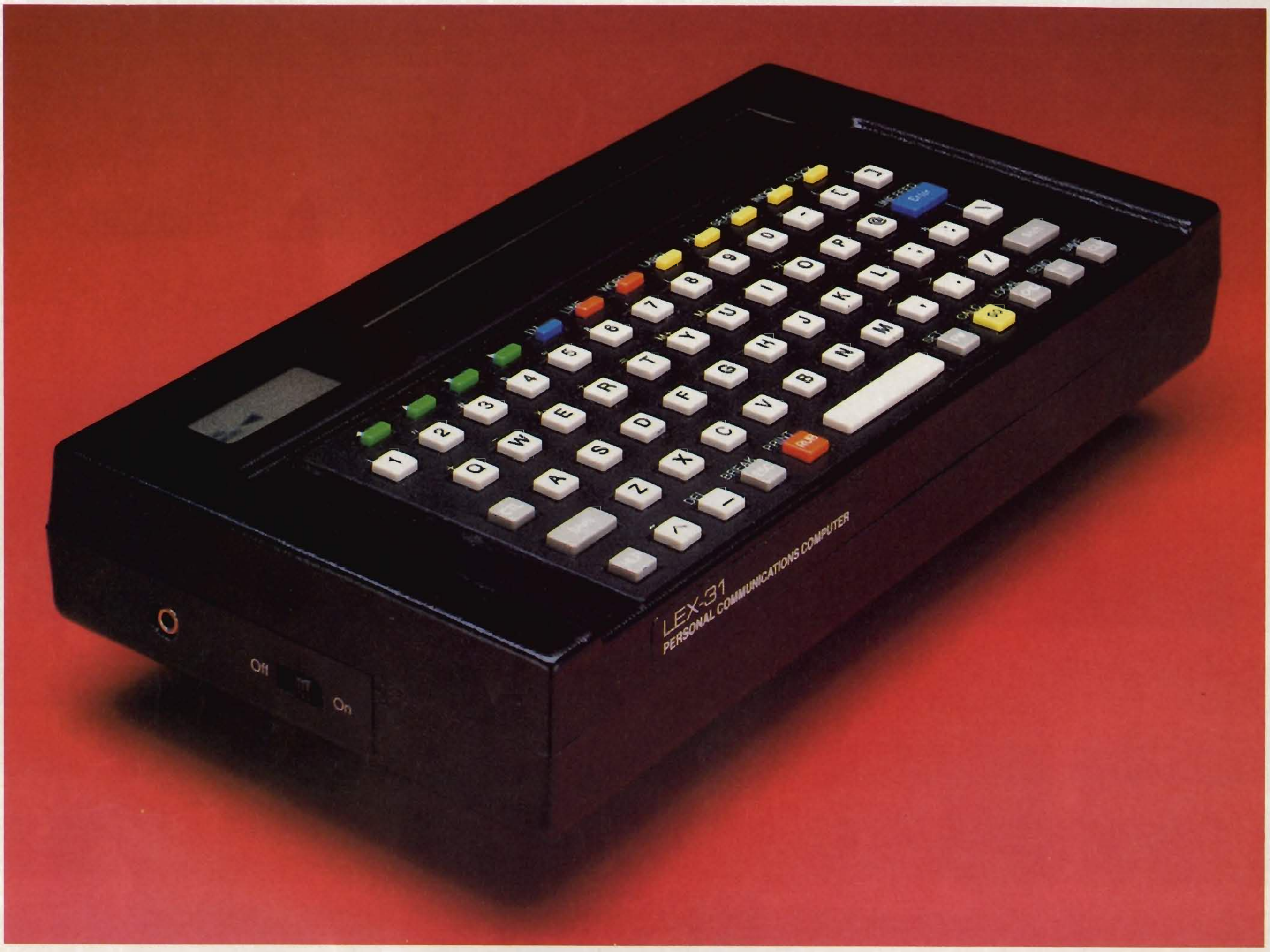
CASIO FX-700P

With a miniature television already to its credit, Casio (15 Gardner Road, Fairfield, N.J. 07006, 201-575-7400) continues to bring electronics down to size. The FX-700P hand-held computer offers a 54-key keyboard and one-key commands to permit input of BASIC easily and quickly. Utilizing a 12-digit, dot matrix display, the unit handles English capital and small letters as well as a variety of symbols with corrections, additions and deletions simple to accomplish. The FX-700P performs all basic math and scientific functions and has true algebraic logic, while an FP-12 mini thermal printer can print a program at the rate of two lines per second. (About $100; FP-12 about $70.)


EPSON
HX-20
EXPANSION UNIT
MICRO CASSETTE DRIVE
NUM
HOME CLR
SCRN
INS DEL
TAB
CTRL
SHIFT
RETURN
SHIFT
GRPH
CAPS LOCK

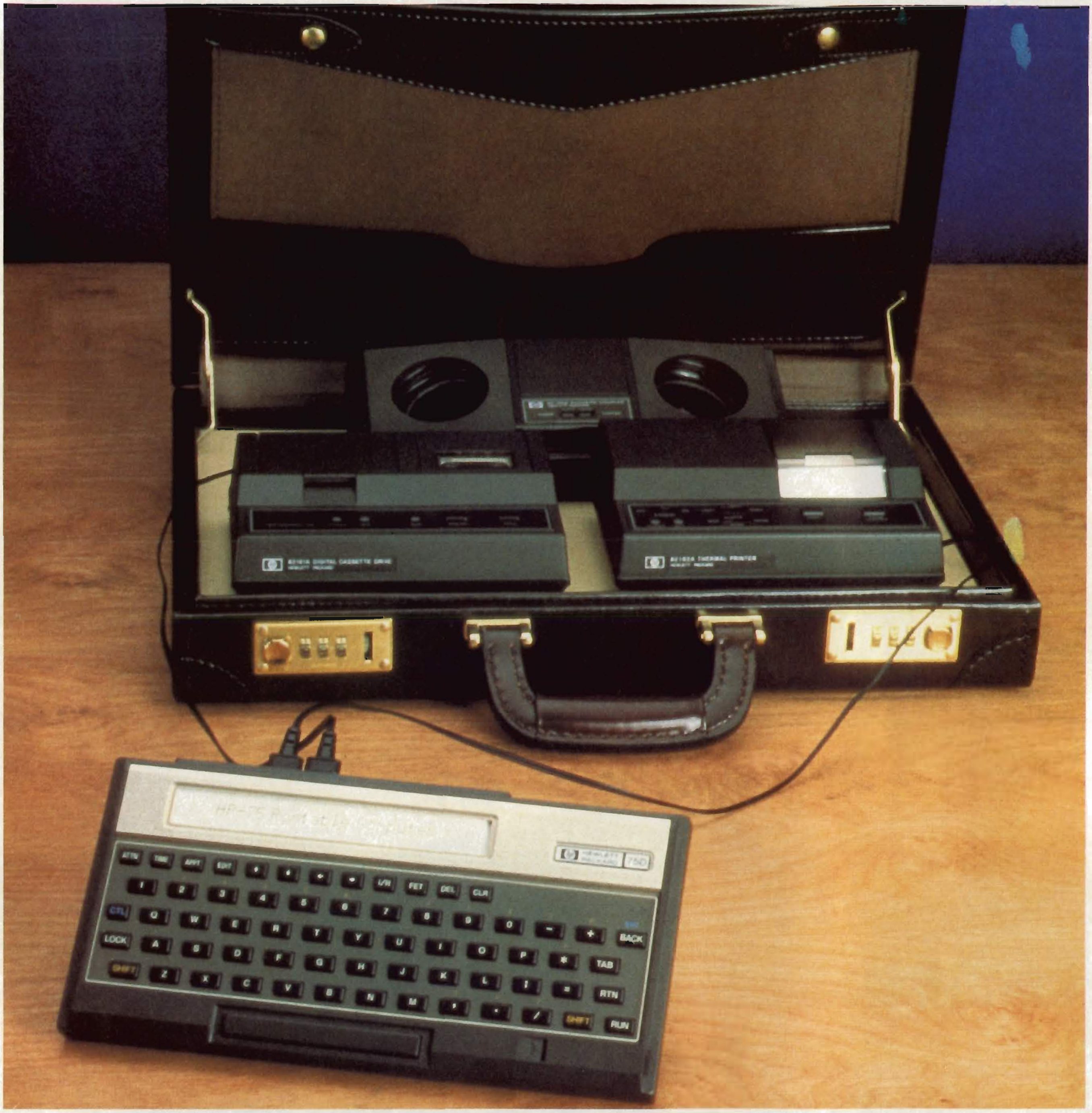
EPSON HX-20

Weighing in at just under four pounds, Epson's (3415 Kashiwa Street, Torrance, Calif. 90505, 213-539-9140) portable HX-20 delivers all the capabilities of a personal desktop computer. With 16K RAM (optionally expandable to 32K), and 32K ROM (expandable to 64K), the unit can operate over 50 hours on its own rechargeable batteries. There's a full-size ASCII keyboard and the ability to call up ten separate program functions at the push of a button. In addition, the HX-20 incorporates a built-in 24 column dot matrix impact microprinter as well as a 20 character by 4 line liquid crystal display screen which brings easy-to-read upper and lower case letters, numbers, punctuation and graphics in addition to an adjustable viewing angle. (About $800.)



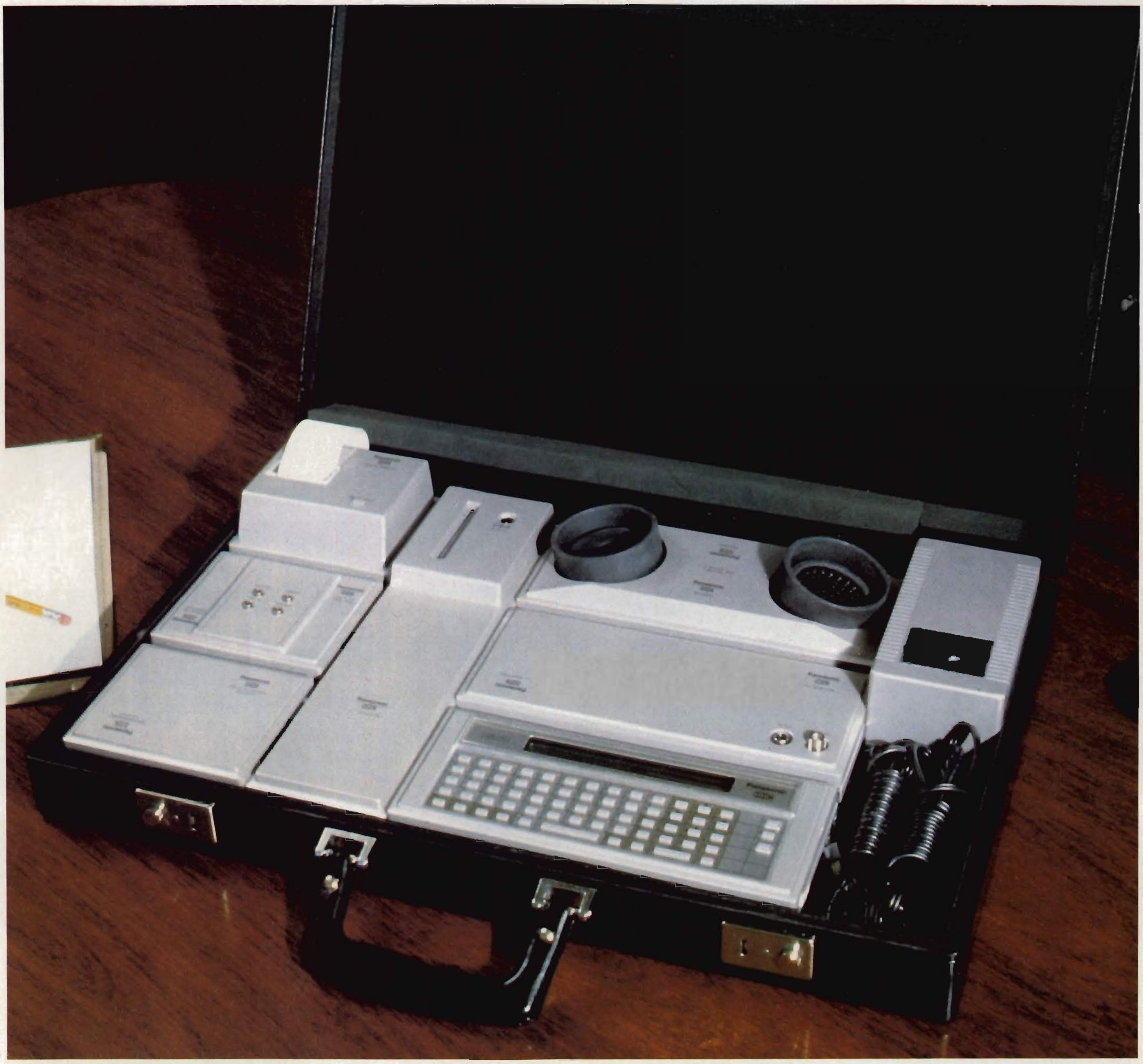
LEXICON
LEX-31

The world's first hand-held personal communications computer, Lexicon Corporation's (1541 N.W. 65th Avenue, Fort Lauderdale, Fla. 33313, 800-327-8913) LEX-31 is an easy-to-operate information center which can access data banks through the telephone and provides single keystroke access to the Dow Jones News/Retrieval Service. In terms of the latter, owners receive their own password and one free hour of non-prime-time system usage for sports and weather information, Wall Street Journal highlights and updated stock quotations. Weighing only two pounds, the LEX-31 offers built-in word processing capability, a memory calculator, as well as a calendar and alarm clock. Additional features include a built-in 300-baud asychnonous Bell 103A compatible telephone modem with direct connect capability, a 16K byte memory, a 73-key color coded ASCII keyboard and a 40-character LCD display. (About $1,000.)



HEWLETT-PACKARD HP-75

Weighing only 26 ounces, the new HP-75 from Hewlett-Packard features BASIC language programmability and such software as VisiCalc and a variety of graphics presentations. Able to run on batteries and retain a memory when turned off, the unit is the first in a proposed Series 70 of portable computers. A 32-character LCD serves as a movable window on a 96-character line, while the HP-75 takes full advantage of its 16K bytes of user memory, which can be increased via a plug-in module to 24K bytes of RAM. Three software-module, plug-in ports accept 8K- or 16K-byte ROM modules, which allows the computer to be customized for specific applications and operations. In addition, the unit is available with Hewlett-Packard's own Interface Loop, providing full access to a range of peripherals, as well as potential link-ups with other computer systems. (About $1000.)

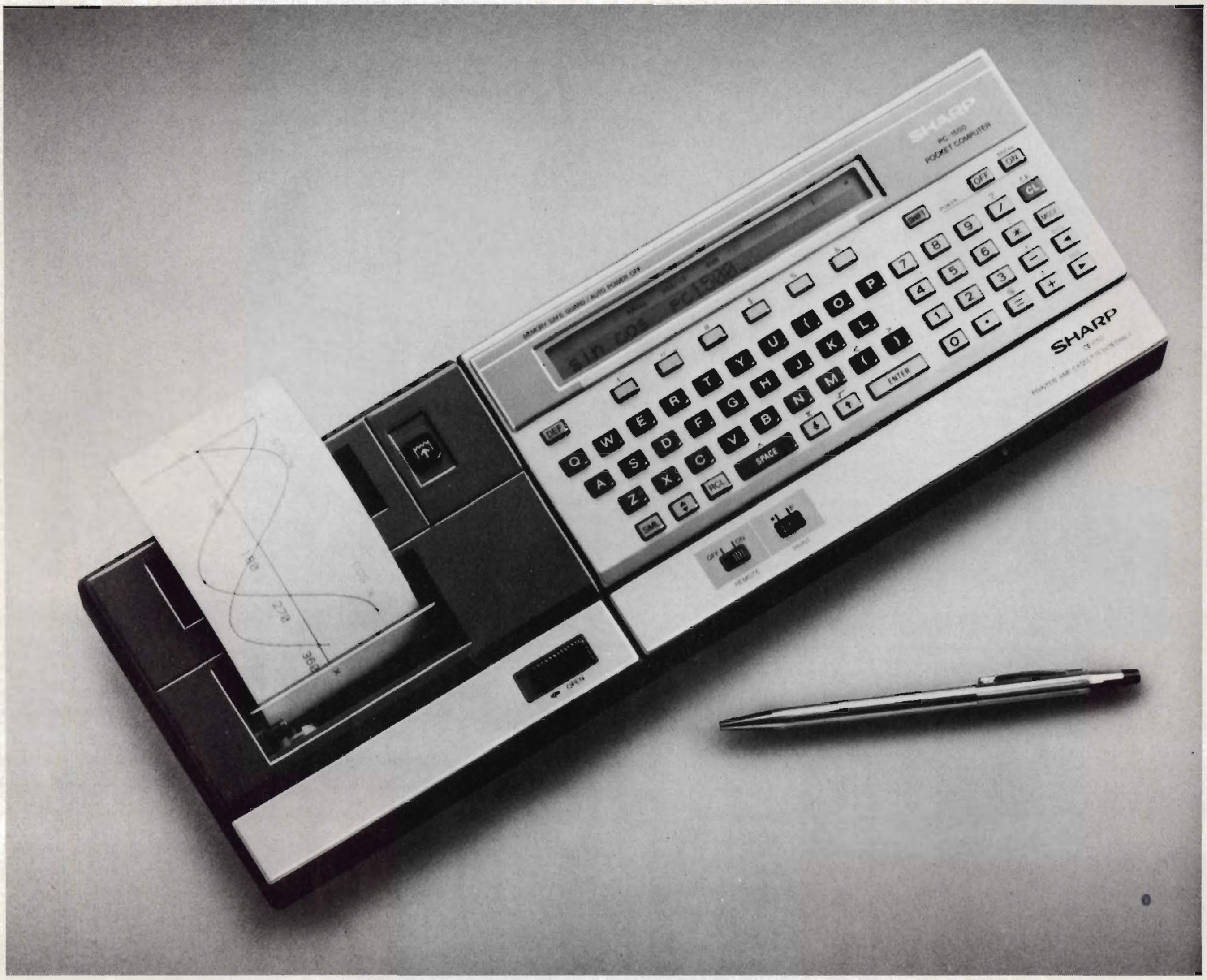


PANASONIC HAND HELD COMPUTER

A truly portable hand-held computer, Panasonic's (One Panasonic Way, Secaucus, N.J. 07094, 201-348-7000) HHC, also known as The Link, features a built-in rechargeable nickel cadmium battery pack that protects stored data while traveling. Weighing only 14 ounces, there's 4K bytes of internal programmable memory which can be expanded to 52K bytes externally, via the addition of programmable memory peripherals. ROM memory is 16K bytes internally and 3 program capsule slots allow for adding up to 48K bytes of more ROM. Peripheral components available to expand the capabilities of the HHC include a portable thermal printer, a telecomputing system which can make the unit a remote terminal for other computers, and a color television interface allowing for the display of 16 lines of 32 characters each, or up to 48 by 64 picture element graphics in eight colors and black. (With a full complement of peripherals, about $1,200.)

RADIO SHACK TRS-80 PC-4

After enjoying a great amount of success with its full line of larger size personal computers, Radio Shack (1800 One Tandy Center, Fort Worth, Texas 76102, 817-390-3300) has announced the addition of a compact, pocket model. The TRS-80 PC-4 features a typewriter-style 53-key keyboard for alphabetic input as well as a 10-key numeric data entry pad. An easy-to-read 12-character LCD scrolls horizontally to display up to 62 characters accessed through an Extension Mode. The unit's BASIC language offers programming ease, with the ability to maintain up to ten short programs in memory. Powered by two lithium batteries, an option to expand the computer's capabilities is the PC-4 Printer which serves up 20 characters per line in an electro-thermal 5 x 7 dot matrix. (About $80; printer about $80.)

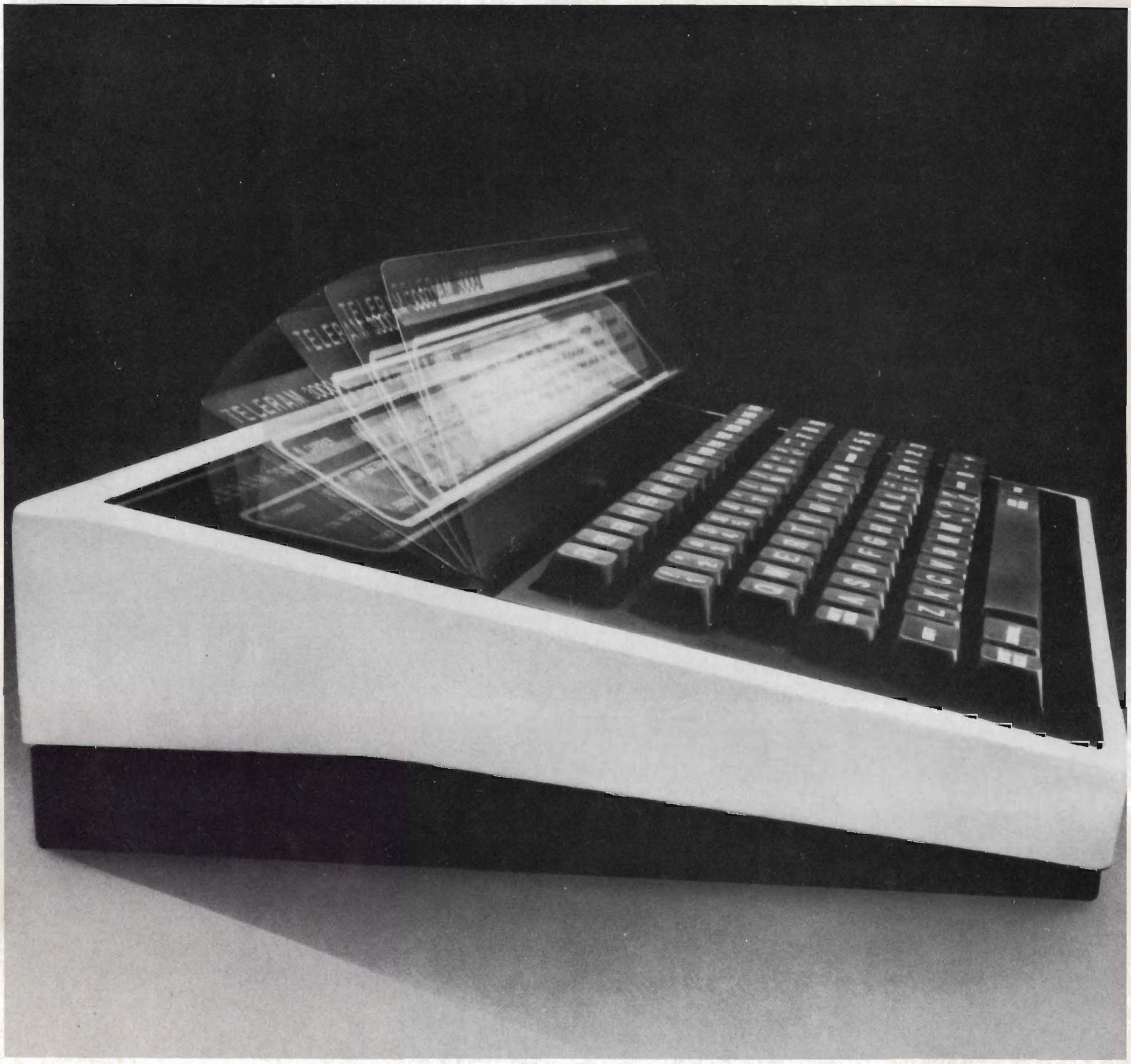


SHARP PC-1500

A fully featured pocket computer, the PC-1500 from Sharp Electronics (10 Sharp Plaza, Paramus, N.J. 07652, 201-265-5600) offers large memory capacity with 16K bytes of ROM and 3.5K bytes of RAM, as well as a Memory Safe Guard which conveniently prevents the loss of programs or data, even when the unit is turned off. The mini-graphic (7 x 156 dots) 26-digit liquid crystal display allows for the viewing of upper and lower case letters, numbers, special signs and symbols, while six software keys have been set aside for specific functions or program commands. In addition, an optional CE-150 color graphic printer/cassette interface offers automatic program, data, and calculation printing along with four-color graphics and the ability to tap into outside cassette tape recorders for data and program storage as well as the recall of information. (About $300; CE-150 about $250.)

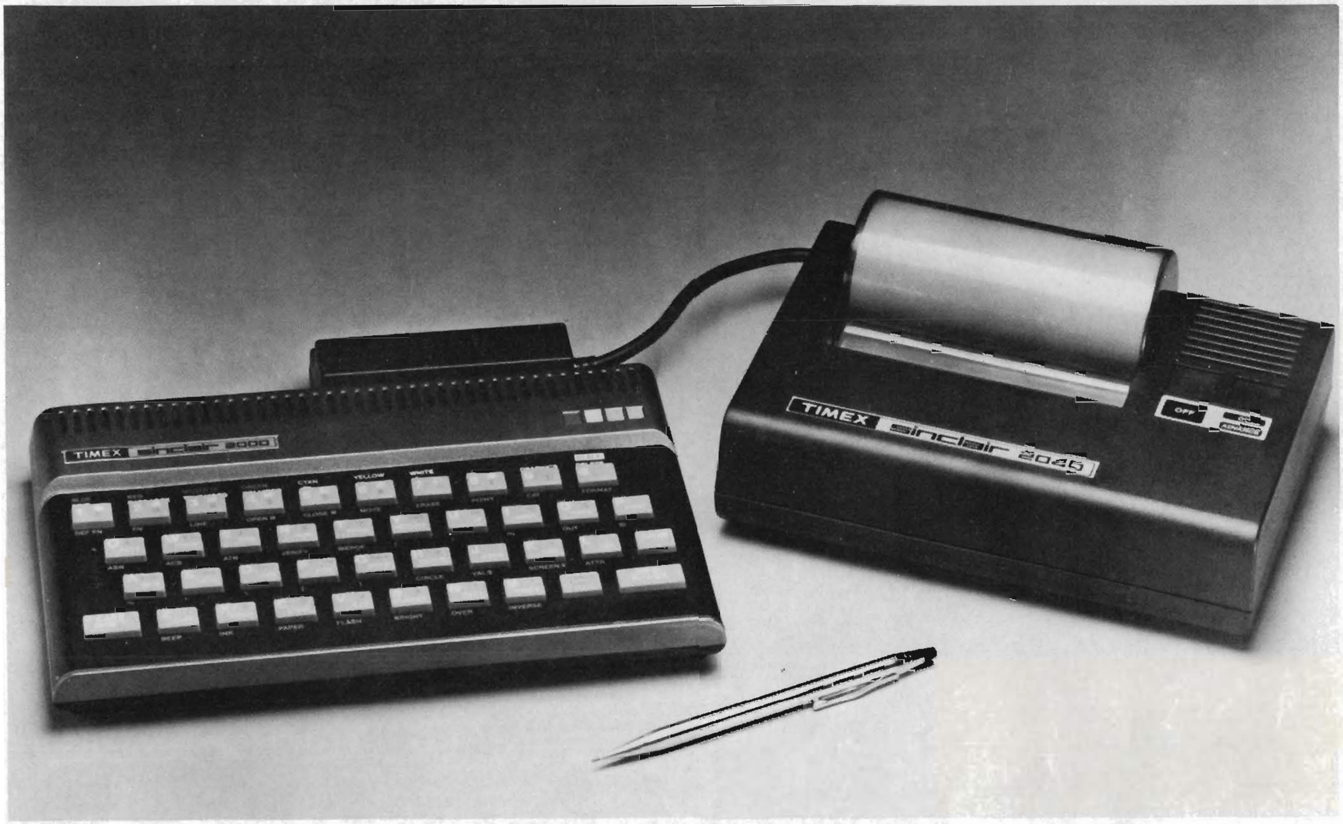
STM ELECTRONICS PIED PIPER I

Portability is the key with STM Electronics' (525 Middlefield Road, Suite 130, Menlo Park, Calif. 94025, 415-326-6226) newly introduced Pied Piper I. Featuring a full ASCII keyboard, the less than fifteen pound computer is built around a Z80A microprocessor and offers 64K bytes of RAM, 256K bytes of slim-line minifloppy disk mass storage as well as a connector for an additional floppy disk. If that weren't enough, a 5 or 10 megabyte hard disk sub-system can also be added. The Pied Piper I can interface with a standard CRT monitor to provide a 24 line by 80 character screen format, or, via an RF modulator, be hooked up to a regular television set. (About $1,300.)



TELERAM 3000

Weighing less than 10-pounds, the Teleram (2 Corporate Park Drive, White Plains, N.Y. 10604, 914-694-9270) 3000 is a fully capable, CP/M compatible system designed to easily fit into a brief case. Besides a full typewriter-like keyboard, with numeric/cursor keypad and 16 programmable function keys, the 3000 features a flat-panel vertically scrolling liquid crystal display, which can be adjusted to any of five different viewing positions, and allows for checking up to four lines at a time, with 80 characters per line. A built-in battery can power the system's 64K RAM and 4K ROM, as well as up to 256K bytes of non-volatile bubble memory, for five hours. (About $2,995.)



TIMEX SINCLAIR 2000

Emphasizing a full complement of features with 48K RAM, Timex Computer Corporation (1579 Straits Turnpike, Middlebury, Conn. 06762, 203-573-5874) is hoping that lightning will strike twice with the introduction of its Timex Sinclair 2000. Weighing 20 ounces, the unit offers a multi-function keyboard with a repeat feature on all 40 keys, upper and lower case letters, and 16 built-in graphics characters. The TS2000 provides programmable sound and high resolution color graphics, including a range of eight colors and separate control for foreground, background and border areas. Compatible with both the TS2000 and TS1000, the model 2040 32-column dot matrix thermal printer features complete graphics and text capability for full screen printing with single key copy command and program controlled printing. (About $200; TS2040 printer about $100.)

SR R1,R3
OS XL30
R12,0
R12,0
PL-1
BEGIN
CALL INIT
END;
PIC S9(8)
COMP
VALUE
LL INIT
DO J=1
TO
IF I1=0 THEN
PRINT NAME;'
ELSE DO;

SPEAK EASY

Interpreting Computer Language Dialects

By R.D.L. Sperberg

A close friend believes that simple, strong, direct metaphors are the best handle for dealing with an ever more complex world. She thinks of the computer as a suitcase; buying an off-the-shelf program is like taking a train ride, you have to go where it takes you. Obviously, then, the suitcase you choose should match the programs you're going to buy. Her problem is "I can't find a train that goes everywhere I want to go." What she needs is a car, a computer language. Then she can go wherever she wants by writing her own programs.

A computer language is actually one term that needs no analogy to understand. A series of instructions are communicated to the computer; the form they take must follow rigorous rules of grammar (computers are no more tolerant of mistakes than Latin teachers). A misplaced comma or omitted word causes just as much trouble in a program as in Uncle Abner's will. Sometimes, the vocabulary can be daunting, the inclusion of odd symbols baffling. There are myriad languages around, all with variant dialects confusing the scene. BASIC, alone, has some 200 versions, and a BASIC program understandable to one machine may be incomprehensible to another (just as a Cockney's English might confound a New Yorker). Furthermore, like automobile models, computer languages share the same capabilities, but each goes about things in its own way, with its own style. Whether you settle on a Lamborghini or Ford pick-up, Pascal or COBOL, BASIC or Forth, depends very much on your primary needs.

The first question to ask yourself is, "Do I really want to learn to program?" Everyone needs to be able to understand the kinds of commands a computer is able to follow. However, not everybody has to know how to program, step by step. For most of your wants, "canned" software, with prepackaged instructions, is available. More simply expressed, you can drive a car without knowing anything more about its operation than how to change a flat tire. Programming is on about the same level as tuning your car's engine, and makes about the same sense: You're just a little more self-reliant than the next fellow, and not in such a jam when things go haywire.

Of course, in five years, nobody but professionals will bother learning programming, anyway. Full-scale programs will ask what you want to do, then write the steps for you, and you'll be doing this in English. These **meta-programs** might ask you to explain a few terms, but you won't be concerned with step-by-step solutions.

Meta-programs, the first of which have already begun to appear, owe their development in part to the plummeting cost of computer chips and nascent transition from the eight-bit to sixteen-bit microprocessor. As you may imagine, these program foundaries require room to perform their wizardry—memory space that was considered unthinkable in microcomputers until just a year or two ago.

The first computer language you'll encounter, **BASIC**, actually owes its predominance to its maneuverability in tight quarters—a trait early microcomputer designers admired at a time that memory space was so expensive. Designed in 1964 and 1965 at Dartmouth College by John G. Kemeny, Thomas E. Kurtz and their graduate assistants under a grant from the National Science Foundation, **BASIC** was meant to be not only quickly learned but adaptable in principle to

IF I1 =0 THEN
PRINT NAME="
ELSE DO;

"...BASIC was meant to be not only quickly learned, but adaptable in principle..."

more complex languages whose study might come later. Consequently, the designers omitted some advanced constructs, blurred the division between language and operating system and echoed the architecture of FORTRAN, the first standardized language.

BASIC's name derives from the descriptive phrase expressing the Dartmouth team's goal: Beginner's All-purpose Symbolic Instruction Code. And BASIC is just that: so simple for beginners to grasp, you should be writing programs the first day you learn the language. Plus, it's flexible enough to deal with everything you use a computer for: manipulating text, numbers, scientific formulas and graphics. So, many people stick with BASIC even after they understand more advanced programming.

The ability to readily transport a program from one type of machine to another—portability—differentiates **high-level languages**, which have it, from **low-level**, which don't. Each computer has a processor that understands instructions in only one form; this **machine language** consists of blocks of electrical signals that are generally represented as an eight-digit number in base two, all zeroes and ones. (Eight digits because most microprocessors use eight bits for their instructions, a bit being one electrical signal.) The machine language for, say, Zilog's Z-80 microprocessor is completely unlike that for Motorola's 6502, and even a program to do the simplest job isn't translatable from one to the other because of the differences; it's easier to start from scratch.

Like high-school Spanish students, computers find it impossible to operate in the language you use to communicate with it, instead first translating everything to their native tongue. Consequently, the closer you get to machine language, the more direct the translation and, inevitably, the faster the program's execution. You never write directly in machine language; rather, you use an alphanumeric version of the processor's instruction set, an **assembly language**. Translation is handled by an **assembler**.

The disadvantages of assembly language are as profound as its advantages. While the program code is compact and speedy, it's also dependent on the processor's architecture, which will be completely outdated in a few short years. Because programs are so detail-oriented, mistakes are common and hard to find, and the writing itself is tedious. For example, describing how to get to Chicago on the same level of detail would go something like "I took three steps to the front door, opened it, went through, shut it, turned left, went five steps to the car, opened the car door, got in, shut the car door, took out the car keys..." and so on. Forget to turn left and everything after is meaningless to the computer.

Such a narrative would be harder to read than "I drove to the airport and flew to Chicago," but there are no summaries in assembly language, no easy way to look at one part of a program and tell what it does. Ultimately, this is a damning criticism because, although it took years to realize, the easier it is for humans to read a computer program (read, not write), the better.

BASIC is too often faulted for poor readability, even though, as a high-level language, one of its commands might contain ten machine-language instructions. Readability is an asset when a program is being written, especially if more than one person is involved, but it becomes indispensable when the program's being modified: You have to be able to find every line affected by the change.

Most current general-purpose languages attack a large problem by breaking it down and dealing with each section separately. Programs written in these **modular languages** are easy to modify—you simply pull out the self-contained part you want to alter and plug in the new one. BASIC simulates this structure by using subroutines, but they're not really independent units; a haphazard change in a variable name might affect a variable in a different subroutine. (Modular languages' boundaries prevent such side effects, making it easier for programs to share already tested utility sections.)

Since BASIC wasn't designed to be modular, it lacks graceful movement from one section to another, relying on the grasshopper command "GOTO." A BASIC program's sequence of actions is often confusing because the program literally hops around, from GOTO to GOTO. As a rule of thumb, BASIC programs longer than 50 lines are overly confusing and better written in another language.

BASIC was intended for beginners, but be forewarned that it fosters many poor programming habits by relying on GOTO's and discouraging self-explanatory names for variables.

Perhaps the best alternatives to BASIC for learning programming are **Pascal** and **Logo**. Both were designed as introductory languages and share an intelligent approach.

Pascal was developed in Switzerland in the late Sixties by Miklaus Wirth and, as much as any language, bears the stamp of a single mind. Modular in nature, it was the first

". . .Pascal's design reflects the systematic way programmers actually solve problems. . ."

SR R1,R3
DS XL80
R12,0
R12,0

language to incorporate "structured programming" (omitting GOTO's), and has probably been adopted worldwide faster than any other language in the last decade. Whereas low-level languages are shaped by their processors' architecture and BASIC echoes FORTRAN, Pascal's design reflects the systematic way programmers actually solve problems and, in doing so, encourages a thoughtful approach.

Naturally, many colleges choose Pascal as the best language to teach programming fundamentals—those qualities that transcend a specific language. Plus, its usefulness as a bridge to other languages is especially strong in connection with **Ada,** the new Department of Defense-sponsored language that promises to be *the* one of the next 20 years. Although the department rejected Pascal as not entirely suitable for its purposes, Ada does bear a strong family resemblance to it, sharing its insistence on reliability.

Unlike BASIC—in fact, unlike any other languages except FORTRAN and COBOL—a strictly defined Pascal standard has been approved internationally. Such a standard reduces (but doesn't eliminate) various dialects, and aids in program portability. In the microcomputer world, six more-or-less-compatible Pascals are available. (Since Wirth designed Pascal at a time when tape storage was prevalent but random disk storage rare, its techniques for handling input and output are archaic, especially in its treatment of text. This is where most versions "improve" upon the standard.)

There's one major difference in how BASIC and Pascal are treated by a computer. Essentially, a high-level language can be translated into machine language in two ways. A **compiler** takes a finished program and generates a complete translation somewhat later, which you then run on your computer; the time lag, even if only minutes, is noticeable, and sincerely frustrating when the compilation indicates you made a trivial error in, say, the second line and must start again. An **interpreter**, on the other hand, is interactive, translating each line immediately. It'll halt on line two and tell you right away if things are amiss.

Each kind of translator has its advantages. Using an interpreter, it's relatively easy to find and fix problems in a new program, while a compiler can execute finished programs much faster. A language can be either compiled or interpreted but, generally, BASIC is available in interpreter versions, Pascal in compiled. Since responses are instantaneous with interpreters, they tend to be very good for program development and learning programming. This is in BASIC's favor.

It's also an advantage of the modular language **Logo**. Not as widely used as Pascal, it features a structure incorporating child psychologist Jean Piaget's research into how children learn and think.

From the very beginning (1970), the Logo Group at the Massachusetts Institute of Technology, under director Seymour Papert, has disregarded machine limitations in the language's design in favor of including simple but powerful commands to spice it up for beginners. As M.I.T. professor Harold Abelson notes, "It's the very lack of expressive power in primitive languages such as BASIC that makes it difficult to write simple, interesting programs."

Two of Logo's features reflecting its concern with interesting capabilities are "turtle graphics" (the commands that drive a "turtle" on the screen for drawing), and list manipulation (which deals with language processing in a way unlike most other computer languages).

Other computer languages abound, each with some advantage, but none is as widespread or easily comprehended as BASIC, Pascal and Logo. **FORTRAN** and **COBOL** are of the old order, aging titans. In the Fifties programming began with FORTRAN (FORmula TRANslation), and there are still many FORTRAN programs and programmers around, despite its being freighted with handicaps. While FORTRAN was fine for scientists, businesses and governments needed to manipulate large amounts of numbers simply, so they turned to COBOL—not a flawless language by any means, but which did the job. (At one time, perhaps 85 percent of all programs were written in COBOL.)

While earlier languages dealt with numbers, **LISP** developed computation via symbolic expressions. **FORTH** and **C**, on the other hand, have the means for dealing with a computer's hardware at bit level. Sometimes, they're called **medium-level languages**, since they share the machine independence and powerful conceptual and summarizing tools of high-level languages.

Returning to Ada, the Department of Defense, which initiated its design in 1974, refuses to allow any deviant versions, either by adding or omitting features. "Ada-like" languages are already sprouting, but any Ada program should be able to run unchanged on any computer's Ada implementation. And that's no small accomplishment. ●

READ OUTS

HOUSE MATES

The "electronic cottage" is a term used in "The Third Wave," Alvin Toffler's ground-breaking work about the effects of computers on life in the late 20th century, and refers to a home with entertainment, shopping services, business facilities and more supplied by a computer system. Instead of gathering in front of a fireplace or television, the family of tomorrow will gather around the computer. "The Electronic Cottage" is also the title of Joseph Deken's new book (Bantam, $3.95), which divides today's world into three segments: enthusiasts, students, scientists and others who regularly use computers and can write their own programs if necessary; consumers who own and use computers but don't understand them; and those who don't use computers, themselves, but are exposed to them in day-to-day life via banks, airlines and so on.

In Deken's world of tomorrow, however, the computer virtually becomes a fairy-tale genie: Your word is its command. It'll plan dinner parties, balance your checkbook, tutor you and be playmate, helper, advisor and coworker. Newspapers and magazines will become obsolete, as your computer will run a personalized "clipping" service. Deken also predicts the following in the forseeable future:

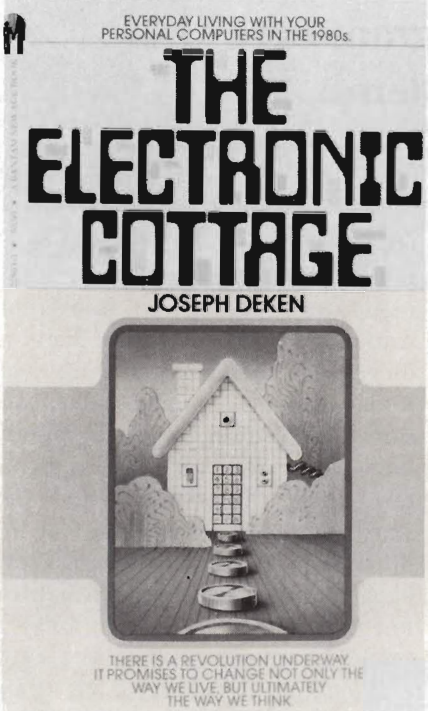
- Your refrigerator will be computerized so, by simply pushing a button, you'll know for sure what's on hand. Interfaced with cookbook software, the computer will tell you what to make for dinner (with the ingredients you already have), the recipes provided.

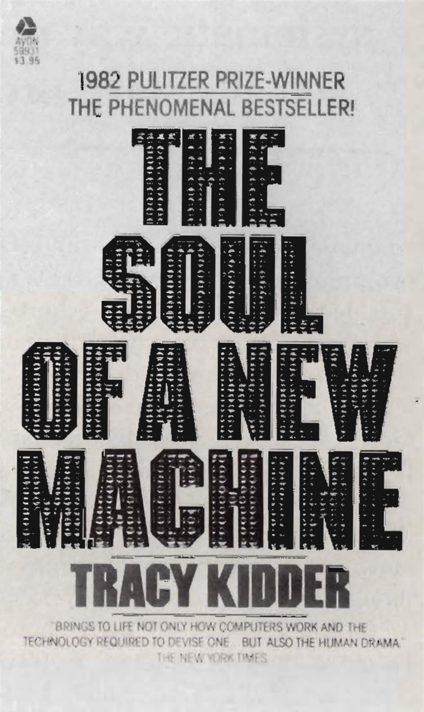
- Traditional board and even card games will evolve into "megagames," whereby a computer will control rolls of dice and directions of play.

- Self-help books will become obsolete, as your computer will act as lawyer, doctor and mechanical advisor. It will give specific technical advice for particular problems, instead of offering general solutions.

- Computers will become significant forces in improving musical and sports techniques, by teaching how to correct errors and develop aptitudes.

In short, Deken paints a world in which the most mundane chores will be handled by computers. You'll be able to conduct business, make purchases and correspond from your armchair in your comfortable electronic cottage of the future.


EVERYDAY LIVING WITH YOUR PERSONAL COMPUTERS IN THE 1980s.
THE ELECTRONIC COTTAGE
JOSEPH DEKEN
THERE IS A REVOLUTION UNDERWAY. IT PROMISES TO CHANGE NOT ONLY THE WAY WE LIVE, BUT ULTIMATELY THE WAY WE THINK.


AVON
1982 PULITZER PRIZE-WINNER
THE PHENOMENAL BESTSELLER!
THE SOUL OF A NEW MACHINE
TRACY KIDDER
"BRINGS TO LIFE NOT ONLY HOW COMPUTERS WORK AND THE TECHNOLOGY REQUIRED TO DEVISE ONE... BUT ALSO THE HUMAN DRAMA."
THE NEW YORK TIMES

BIRTH CONTROL

The tale of a new computer's birth and the technological wizards who developed it, Tracy Kidder's "The Soul of a New Machine" (Avon, $3.95) takes place off a drab strip of highway in central Massachusetts, in an unobtrusive two-story brick building. The book begins with a thumbnail sketch of modern computers' history, from the cumbersome early brains to the more recent, compact personal models. While IBM dominated the industry for years, it originally opted to bow out of the minicomputer sweepstakes, leaving the field open for companies like Digital Equipment and Data General. The "new machine" of the title was, in fact, developed by the latter.

Data General was formed by Edson de Castro, and his firm is a good example of being in the right place at the right time. Its first machines were launched in the late Sixties, aimed at a market looking for a "bargain." Since DG didn't offer much support for its hardware, purchasers were on their own—with a good machine at an affordable price for people who could understand and service it. This computer, NOVA, launched the company. As time went on, DG introduced machines compatable with NOVA software, the Eclipse series; a full decade later, a completely redesigned, Eclipse software-compatible machine was born, code-named Eagle.

Kidder's fascinating book takes the reader into the binary world of computer engineers, and there has rarely been a more interesting group in a novel or detective story—or a drabber setting. At DG, machines are conceived, designed, built and tested in a group of restricted rooms in the basement of the building. The men actually involved in designing Eagle all did so for different personal reasons. Tom West, for example, the enigmatic project head, had poured tremendous effort into a computer that was never marketed, so he was determined to see this project through—even if it meant alienating friends and co-workers. West appointed former protege Carl Alsing to head the dozen or so young designers, "the micro-kids," who put just about everything else in their lives aside to work on the Eagle, as did the more experienced "Hardy Boys."

This diverse group of designers, engineers and debuggers was commited to an almost impossible schedule in order to have the Eagle ready before the competition. The scientific detective work, as well as the painstaking details that must be considered and incorporated in computer design are all discussed.

It hasn't quite gotten to the point where machines design themselves, so this glimpse of what goes on behind the scenes—the intrigue, arguments, defeats and triumphs—is revelatory. After reading this book, you'll never again be able to look at your Atari 800 or Vic-20 without wondering who gave up months of time to create it. —LOIS CANTWELL

GUIDING FORCE

Those already plugged into the Commodore 64's extensive features, from game-cartridge adaptability and arcade-style graphics to unusually high-caliber computing, will also want to hook up with the 486-page "Commodore 64 Programmer's Reference Guide" (Howard W. Sams and Co., Inc., 4300 West 62nd Street, Indianapolis, Ind. 46260; $19.95 at bookstores and authorized Commodore dealers). Covering every topic from MOS technology chip specifications to memory maps, it's an indispensible asset for fully exploiting the machine's home, educational and business potential.

Conveniently spiral-bound, comprehensively illustrated and indexed, as well as color-coded for quick reference and visual ease, the Commodore guide presents all information on two levels: first for the novice, again for the more experienced programmer. Thus, everyone from the BASIC beginner to the professional versant in 6502 machine language should find its step-by-step instructions facilely followed—so much so, in fact, that they'll be readily awaiting "Making Music on the C-64" and "CP/M for the Commodore 64," upcoming manuals in the series due for print-out this spring.

—NICHOLAS CRAWFORD

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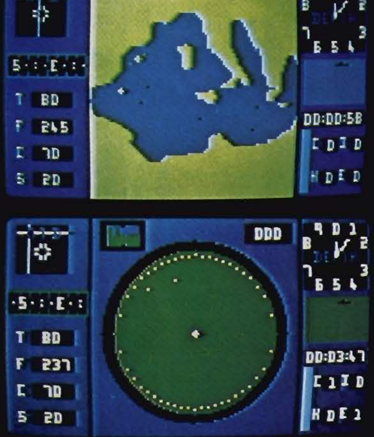

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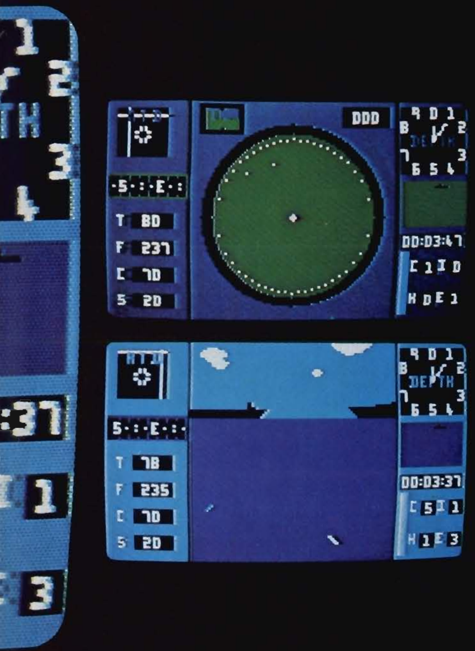

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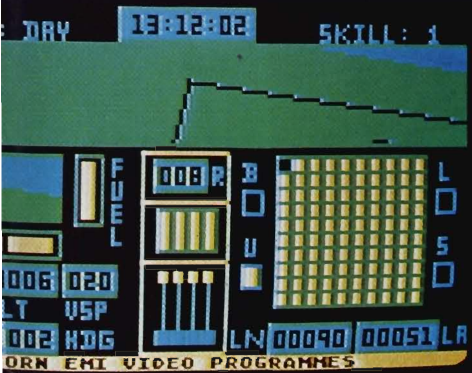

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VIDEO

Illustration By Richard Hescox

HOME SWEET HOME

A Computer Tale of Tomorrow

By Jay Carter

Uncle Frederick is so weird when he talks about how things were when he was growing up. Even Miss Jacobs in our Pictorial History of Recent Civilization reference course doesn't have scanning disks on file that show some of the ways life used to be. It really makes me wonder about how much is true and how much is Uncle Frederick's imagination."

"Well, it's not as if he *wasn't* there," Melinda responded to her younger brother, Brian.

When it came to Uncle Frederick, they always seemed to have this discussion regarding what and what not to believe about a world so dramatically different from the one portrayed in bedtime stories. It all sounded so strange and foreign to the ears of a ten- and twelve-year-old. The children's mother often tried to temper the ramblings of her eccentric brother, 30 years older than she was and the sole surviving member of her family, so they wouldn't be adversely influenced by his retelling of the past, but she also indulged Frederick's need to have his forum and audience. After five years, it had become an accepted part of the routine, with no one finding any harm in the dialogue, although all tried to keep the content within the boundaries of their home. There were just some things that didn't need to be repeated or ques-

> "... Brian tried to picture the world that might have been before the World Tribunal Council was created ..."

tioned elsewhere.

It was a fantastic proposition for Melinda and Brian to imagine a world without a Central Planning Organizational/Educational and Entertainment Center (CPOEEC) to coordinate the day's activities. After all, there wasn't a home that didn't have one! It would be like not having a remote-controlled video telecommunications unit, which Uncle Frederick often compared to antique telephones, by which you couldn't even see who you were talking to on the other end.

And what about interstellar travel? The previous summer, hadn't they all gone to see Melinda and Brian's older sister, Gwenn, on Habitat Station 19, which orbited Venus, not to mention a Thanksgiving spent with Jack, the eldest of the children, based at the Moon's Mining and Biological Study Outpost? To think that Uncle Frederick was alive before space travel and colonization were a regular occurrence.

"Listen, Melinda, we've gone over it time and time again. Most of the things Uncle Frederick has told us happened before the Global Conflict of '93. You know as well as I do that the information in the Data Bank Directories is not only incomplete, but leaves a lot unanswered about the events leading up to the Conflict. It's almost as if everyone wanted to wipe the slate clean, start fresh and forget all about what had been before."

Brian had used this argument on numerous occasions when he felt that everything else would fail. Somehow, his curiosity was stronger, as was his willingness to accept Uncle Frederick's tales as remembrances based more on fact than fiction. Late at night, as he lay in bed, Brian tried to picture the world that might have been before the World Tribunal Council was created to establish order and structure in a society torn by chaos and upheaval.

For example, there was the notion of kids' games Uncle Frederick would often recount whenever the family sat around the Interactive Sensory Environment Display (ISED) console, playing "Pluto's Defense"—a realistic, voice-activated and-controlled simulation of a not-so-distant battle, beamed on the 10-foot-wide wall screen. It actually made the family feel as if it were on the faraway planet, and all the action was made possible via a direct link between their central home computer system and the programming network.

During one of the game's interludes, Uncle Frederick began to reminisce once again.

"Did I ever tell you about the first home computers?" Uncle Frederick smiled as he spoke, knowing that this was one story he'd told many times. But Melinda and Brian never ceased to be amazed by it or tired of hearing it.

"They were really a world apart from today's completely self-sufficient systems. Why, in the beginning, all we had were machines that played games—not the kind you're used to now, but simple, little creatures that featured almost flat, crude images on the screen. We thought they were really something, and just about everybody was caught up in the excitement back in the early 1980's. I'm trying to remember the name . . . uh, let's see, they were called . . . joysticks. That's right. Joysticks. Knobs, buttons or levers that allowed us to control the action.

"However, before you knew it, the first home computers began to find their way into more and more households. It's funny to think about how fearful most people were regarding computers and the growing technology. As with anything, it was out of a sense of not being comfortable with the unknown, as well as due to the forecasts of a few who predicted that computers would take over the world.

"But the games somehow made it all seem so right and unthreatening. It became something of a status symbol to own one, and everywhere you looked, they were being advertised or promoted for the various tasks they could perform and services they could provide. Why, you wouldn't believe the attention that was focused on them! Each new development or advancement was heralded as the next breakthrough when, in fact, the early days were marked more by refinements of the available technology and little else.

"The ultimate role of the home computer in everyday life was only hinted at by those with futuristic vision, those who could imagine the machines' limitless potential. Much was made of entertainment, as well as the computer's possible use for education or as a conduit for getting information. But it seemed to be the *safe* applications that were emphasized. Not many thought of just how important the computer would become as a household resource, coordinating and organizing a variety of tasks and functions. After all, the role of these machines and that of the updated models that quickly followed were tied into the growing understanding of people who owned them.

"You have to remember," Uncle Frederick continued, looking directly at Melinda and Brian, "that the whole world had to learn about computers. They were something totally new that very few people knew anything about. There were summer camps which sprung up, not like today's all-year training, where children went just to be taught how to use a computer.

"Imagine a world where the computer was a stranger in a strange land and everyone, young and old, had to start at the beginning in order to become familiar with how to use them—let alone knowing what they potentially offered once the learning process was over. Even then, there were limitations because of the slow rate at which computers were tapped for use outside the home.

"There wasn't a sudden wealth of options available for owners to maximize the capabilities of these initial machines, although it didn't take too long for things to develop. While the popularity and demand for computers was still soaring, much of what we now take for granted didn't exist. Some selected communities were fortunate enough to be a part of test programs, but only the surface was being scratched.

"Think about how different it must have been without a computer to call on for doing the shopping from the comfort of your home. You couldn't just lock into a supermarket network and place your grocery order, or have the luxury of going through a department store catalogue via your personal computer monitor. Instead, everyone actually traveled to any number of locations, no matter what the weather, spending more time than was ever necessary, in order to do their shopping and heaven knows what else.

"The computer wasn't seen as an integral part of the family, greeting you at the front door, helping to get dinner prepared, knowing when to turn the lights on or off in any given room, keeping the house cool in summer and warm in winter or even regulating the operation of our entertainment robot, not to mention our housekeeping robot. In fact, robots were yet another novelty back then. And forget about the ISED console and all the visual entertainment, news and other information we're able to get any time of the day or night. People couldn't even talk to their computer and have it respond vocally. There was a whole process of programming, which had to be done on a keyboard, before the computer was able to be of any help at all.

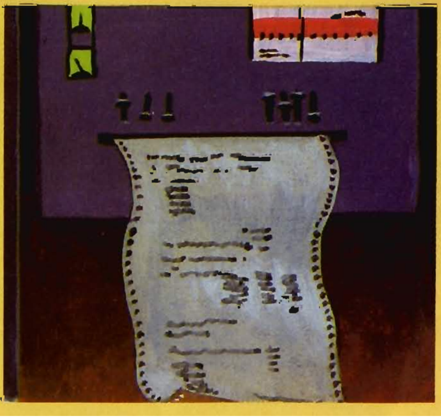
"Yes, indeed, times have changed, and I'm glad I've been around long enough to witness this new, much saner, age. The growth of the computer, in both the home as well as the outside world, is only a small part of man's continuing evolution, but at least it provides a solid reference point as to how far we've come."

Melinda and Brian smiled. Their Uncle Frederick might be weird at times, sometimes talking about things they didn't understand, but he was always a lot of fun.

"Well, are we going to finish 'Pluto's Defense' or just listen to me all night? For once I have a chance to win . . ."

Good old Uncle Frederick—he was one of a kind. ●

". . . imagine a world without a Central Planning Organizational/ Educational and Entertainment Center . . ."



CALLING ALL COMPUTERS

Lining Up Telecommunications' Features and Facilities

By Jerry Willis

Most people are aware of personal computers' video game potential. Most also know that those desktop marvels playing Pac-Man, Frogger and Space Invaders can do an honest day's work as word processors, accounting machines and educational tools. However, another major use of personal computers, telecomputing, or connecting your home computer to others via phone lines, is less common to us. Your phone becomes a link to hundreds, perhaps thousands, of other computers that have been programmed to provide various services. You can sit back in your easy chair, get a comfortable grip on your Apple, Atari or VIC keyboard and do everything from pay bills to read weather reports for Colorado ski resorts.

Telecomputing, in fact, is one of the fastest growing areas of personal computer use (virtually all popular models can be used). Your home computer is connected first to a modem, then to your phone line. You dial another computer's number and, when it "answers," you "talk" to it through your keyboard. Here are just a few services currently available to modem and personal computer owners:

- *Local area networks and computer bulletin boards.* There are hundreds of local computer "networks" now operating in this country, many using regular phone lines for communication. They're run by universities and colleges, computer clubs, amateur radio clubs and special interest groups. Members (or, in some cases, anyone who knows the phone number) interact with the network's computer. Some systems limit use to reading the local electronic bulletin board; others let you use a large computer system's power from the comfort of your home.

In addition to local computer bulletin boards, several national bulletin boards (some with toll-free 800 numbers) are intended for a special audience and may charge for their use. For example, HEX (Handicapped Education Exchange) can be reached by dialing 301-593-7033 and is used by individuals and organizations wanting to exchange information on how technology can be used to help the handicapped. There are also networks for Apple and Commodore owners, lawyers, stock-market speculators, etc.

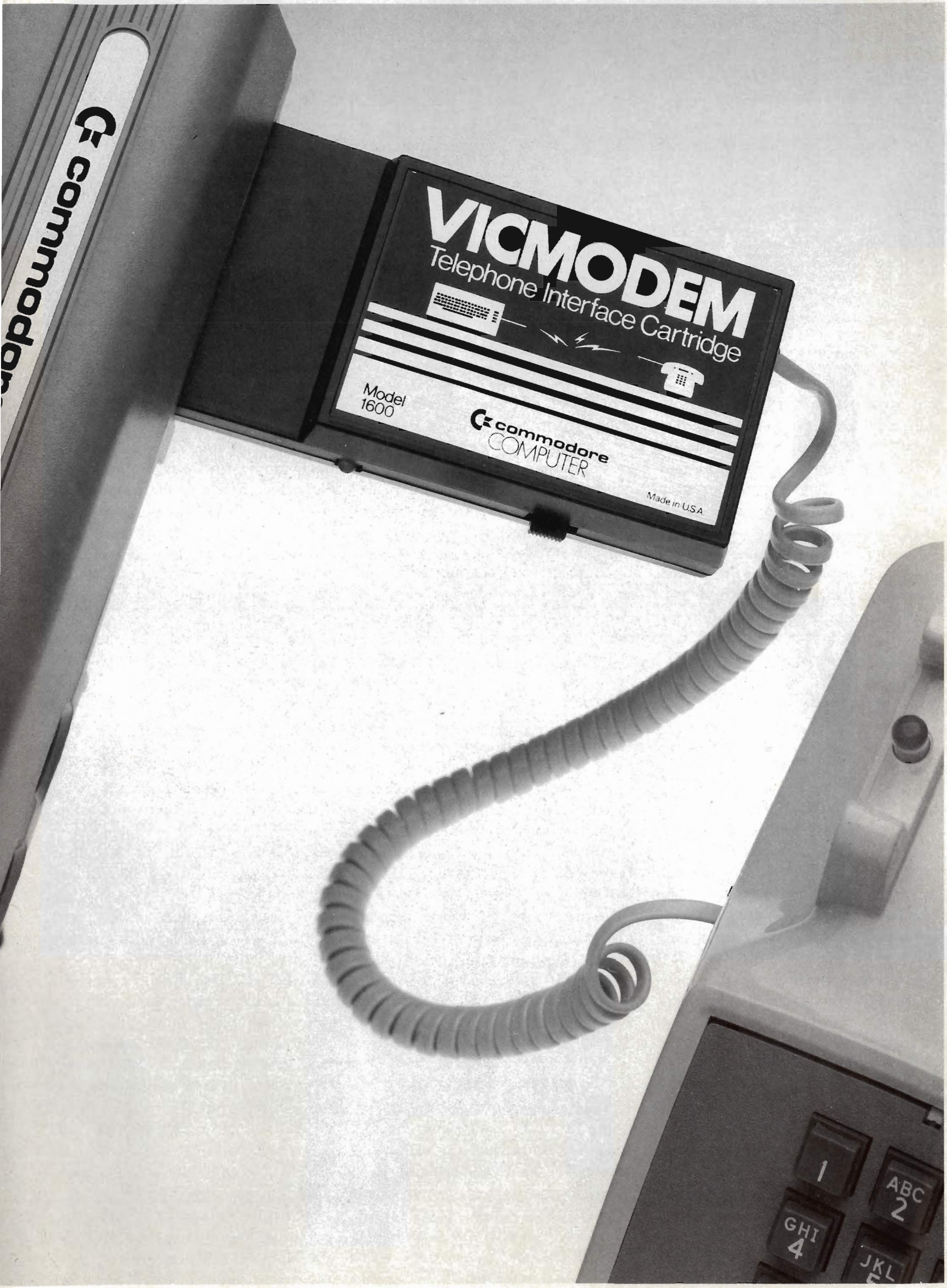
- *Recreational games.* Both CompuServe and The Source, telecomputing "department stores" (discussed below), have provisions for playing games. Dial their numbers, type in your personal identification code, then play 30 or 40 different games. Most, however, are of the strategy type, with relatively inferior graphics (difficult and slow to transmit over phone lines). In addition, though, some services specialize in games. For instance, GameMaster of Evanston, Illinois, offers a choice of 35 games for $40. Most of these pit you against up to five other players: A person living in Florida, for example, might play Nuke Strike against someone in Idaho by dialing 312-328-9009.

- *Downloading programs.* Several networks sell programs by "downloading" them to your computer and billing the cost to a credit card. Some services even let you try the program first; if you like it, it's yours for a small fee. Before you can download programs, however, it's necessary to buy one that will allow your computer to store others on a cassette or diskette. Most of the programs now available are games for Apple and TRS-80 computers. (*Note:* If you have a hot, new program that might be of interest to other owners, some networks will add it to their catalogues. You're then paid royalties based on the number of people who buy it.)

- *Information utilities.* If you need to know a current stock price or the time of the next plane to Orlando, Florida, this information—and much more—can likewise be called by your computer. Both Source and MicroNet have extensive data banks available, so a doctor can check on a new disease; a farmer can receive predictions on a wheat crop in South America; a consumer locate a store selling a particular item. Versions of the UPI and Associated Press news wires are also available on networks, as are newspapers like The New York Times. The Dow Jones Electronic News Service provides information to investors and speculators, while a division of Lockheed Aerospace, Dialog (3460 Hillview Avenue, Palo Alto, Calif. 94304), has over a hundred data bases of interest to professionals in virtually every field. Thus, you can even use your home computer for advice on new metallurgical patents, Federal court cases, space games and college scholarships.

- *Banking and shopping.* Several banks, led by pioneering United American of Knoxville, Tennessee, let customers transfer funds and pay bills by computer. Dial the bank's number, type in your account number, then further instructions. Chem-

Photo By Gene Coleman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GHI 4
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Photo By Perry Greenberg

ical Bank of New York also has provisions for making purchases like airline tickets that are mailed to you and debited to your account. Some experts foresee "banking by computer" as becoming commonplace in the near future.

Shopping by computer, however, has actually caught the public's attention even more. For example, the Music Source allows you to select any of 5000 records or tapes, which are charged to your credit card and delivered by U.P.S. Comp U Star of Stamford, Connecticut, offers discounts on a wide variety of products, which are also charged to you and shipped.

THE SOURCE AND COMPUSERVE

Currently, there are two established national, general-purpose networks, The Source and CompuServe, which can be used by anyone with a small computer, credit card and telephone; the only special equipment required is a modem. Both networks require an initiation fee ($100 for The Source; $30 for CompuServe), and both charge an hourly rate when in use (The Source charges $7.75 during nonpeak time, $20.75 during peak business hours; CompuServe is $5 per hour, more during peak business hours).

The Source and CompuServe have a menu of services available. You can program in many languages (e.g., BASIC, FORTRAN, Pascal, COBOL), use "canned" programs for business and recreational applications, read current news wire copy, search through data banks and shop for bargains in anything from sports cars to used computer equipment. There are also book and movie reviews, in-depth stock-market information, a sports information service plus advice on home repairs and personal health. You can read airline schedules, make hotel reservations and rent a car. There's even a real estate service on The Source.

Two additional services on many national networks are also popular on CompuServe and The Source: electronic mail and "computer CB." Members can transmit messages to each other, and whenever you connect to the service, it indicates whether there are any for you.

You can join CompuServe at many Radio Shack stores or by writing to the company at 5000 Arlington Centre Boulevard, Columbus, Ohio 43220 (614-457-8600). The Source is available from many computer stores and from The Source Telecomputing Corp., 1616 Anderson Road, McLean, Va. 22102 (703-821-6660). Both networks publish very informative magazines about their services.

GETTING "ON LINE"

If you're shopping for a personal computer to be used extensively for telecommunication, consider these factors. Look for a comfortable, easy-to-use keyboard and as much screen capacity as possible. The Commodore VIC, for example, can display only 22 lines of 23 characters, while the Apple II, Atari 800/400 and Commodore 64 display 24 of 40. The Radio Shack Model II has 24 lines of 80 characters but, as you might expect, the more capacity, the higher the price. A Timex 1000 computer costs about $100 but offers only 24 lines of 32 characters; the Radio Shack Model II, with a large keyboard and good display, is about $3000. So, get the best you can afford, but beware of buying less than you want with the idea of adding a better keyboard or special video board later. Such devices are available, but standard software may not work in a 22 line-by-23 character computer that's been modified to 24 by 40 or 24 by 80.

If you already own a personal computer, there are only four additional items you'll need to get started:

- *ACCESS CODES.* If you plan to use a local network, the only code required may be a phone number. Other networks, however, may require you to pay dues or give your VISA or MasterCard number, so you can be charged each month.
- *SERIAL I/O.* The market in low- and moderately-priced personal computers is fiercely competitive, with price a major issue. Manufacturers have thus eliminated virtually everything remotely resembling an option on their basic models to keep prices down. This generally means a serial I/O (input/output) circuit isn't included, but you'll need to connect a modem, and they run $100 and up.
- *TERMINAL SOFTWARE.* Your personal computer is capable of doing a lot of sophisticated computing, but when you connect it to a net-

work, you're actually asking it to "play dumb" and let another computer, on the other end of the phone line, do the work. These devices, terminals, generally perform the task, basically consisting of a keyboard and video display. You can convert your computer into a terminal by loading instructions—terminal software, or communications software—into its memory.

Simple programs for popular computers cost as little as $15, although some are much more. (The Telelink I cartridge for Atari computers is about $30 and typical of basic terminal software.) Naturally, they vary from simple but functional to sophisticated and powerful. With more expensive software you can create and edit messages before signing on the network; once you're on-line, a few key strokes tell the computer which to transmit. Some programs even dial the network and transmit your user code when it answers.

- *MODEM*. A modem (modulator/demodulator) converts a computer's electrical signals into tones that are then transmitted over ordinary telephone lines. (On the other end, another modem converts them back.) There are at least 30 modem manufacturers for small computers, with wares ranging from under $100 to almost $1000. All modems aren't created equal, however, as you might expect from the radical price range; some have special features that might appeal to you.

Basic features to consider when buying a modem are:

Direct-connect versus acoustic. Acoustic modems, such as the Novation Cat, Lexicon Lex-11, Commodore 8010, and Radio Shack AC-3, all have two rubber cuffs for the telephone handset when it's in use. They convert computer signals into audible tones, which are picked up by the microphone in the telephone handset. Acoustic modems are generally cheaper, but they do have drawbacks, most important of which is that they don't work quite as reliably as direct-connect modems. Noise in the room, for example, may be picked up and treated as data. In addition, many emit an annoying hum.

Direct-connect modems, such as the Radio Shack I and II, VIC-Modem, and Hayes Micromodem II, plug into a phone jack, just like a telephone. Direct connect modems are increasing in popularity as their prices become competitive with acoustic models.

Custom versus standard. Most modems are designed to be used with many different computers and terminals; others will work with only one. Consider buying a standard model that can be used with your next, as well as your current, computer.

Answer, originate or both. An answer modem is generally used by the host (network) computer, an originate modem by people who call it. Answer modems transmit tones in the 2000 Hz range, but they listen for those in the 1200 Hz range. (Different tones are necessary to keep a modem from receiving its own transmissions.) Thus, two answer or two originate modems can't "talk" to each other, so you'll need an originate if you plan to use networks like The Source. Why not buy a modem that can be switched from answer to originate as the need arises? They cost a bit more but don't lock you into only one type of telecommunicating.

Half versus full duplex. Some networks require computers to take turns—that is, when one is "talking," the other must "listen." This is called half duplex. Full duplex, however, lets computers transmit and receive data at the same time. Look for this type of terminal software and modem.

Speed. Modems transmit signals at a specific speed, measured in bits per second (BPS). Letters, numbers and symbols are represented inside the computer as patterns of ones and zeros (each one or zero is a bit). All popular networks transmit data at 300 BPS, so be sure your modem is capable of operating at that speed. Faster speeds (e.g., 1200 BPS) may eventually become the standard, but current practices make a less expensive 300 BPS modem the choice of most buyers today. (The term "103" is sometimes seen in modem ads and simply means it can be used on ordinary phone lines to transmit data at 300 BPS.)

Cable compatibility. The standard method of connecting a modem to a computer is with a cable with 25-pin connectors on each end. Atari computers require a 9-pin connector on the computer end (hard to find); the VIC and Commodore 64 don't require a cable if you use a VICModem. The Hayes Micromodem II and Novation Apple-Cat II modem plug directly into the Apple II, thus requiring no computer-to-modem cable. For other computers, the cost of a cable may be as much as $40 and should be taken into consideration when comparison shopping.

My personal modem preference is a 300 BPS, direct-connect, answer/originate, half/full duplex model under $200. There are many, however, who want "bells and whistles." These are a few special modem features available:

Auto answer/connect. Some modems answer the phone when it rings and connect the caller to the computer. This feature is handy when, for example, you have a computer at home but want to use it from a terminal at your office.

Auto dial/intelligent, dial/memory. Some modems also dial for you. A few even hang up when they get a busy signal and dial again until a line is free.

Self test. A means of modems testing themselves and terminal software for correct operation is a nice feature.

Code conversion. A few networks use data codes other than the almost universal ASCII (American Standard Code for Information Interchange). The Novation Apple-Cat II can convert ASCII data to BAUDOT, which is used on some networks for the handicapped. If you have a special application in mind requiring use of a data code other than ASCII, consider a modem that can convert it.

Home controller interface. Do you need to turn on the den lights from 2000 miles away or water the petunias cross-country? Again, the Novation Apple-Cat II modem, among others, has a built-in interface for BSR home controller units.

Frills. Shiny chrome cases and digital alarm clocks are only two extras you can have if you really want them.

With all of the above information, you're ready to telecommunicate. Whatever your interets or needs, there's probably at least one network or service that's just what you're looking for. ●

WORDS FOR THE WISE

COMING TO TERMS WITH COMPUTERS

If all the strange words have scared you off from computers, this section is for you. First of all, you're not alone. The new technology has brought with it an entire new language to learn. But you can become more comfortable and knowledgeable just by taking note of the necessary fundamental vocabulary and terms you'll be encountering as we become a more computerized society. To help you survive the transition, EHC will regularly feature definitions. So relax, Don't be afraid, words don't bite. Below are your building blocks to a world of computer literacy.

Applications software: Programs designed to perform specific tasks, such as games, educational programs, payroll programs or spread sheets.

BASIC: An acronym for beginner's All-purpose Symbolic Instruction Code, a high-level computer language designed for beginners. Because of its simplicity, BASIC quickly became the most common microcomputer language.

Baud: A unit of information transfer. In microcomputers, the baud is defined as one bit per second.

Baud rate: The rate at which information is transferred. For instance, a 300 baud rate is 300 bits per second.

Binary: A number system that uses only two digits, 0 and 1, to express all numeric values. See *digital computer*.

Bit: The basic unit of computer memory. Bit is a short form of binary digit and can have a value of either 1 or 0.

Black box: A piece of equipment viewed only in terms of its input and output, ignoring how it performs its tasks.

Bug: A problem that prevents the computer from performing correctly, or at all.

Byte: A group of eight bits (or a memory cell that can store eight bits) usually treated as a unit. It takes one byte to store each unit of information. For instance, the four-letter word *love* requires four bytes.

Canned software: One or a series of programs ready to run without having to be altered. Many of these programs are copy-protected so changes are not possible.

Cartridge: A 2x3x¾ inch plastic box that contains ROM software such as BASIC.

Cassette drive: a standard tape recorder.

Cassette: A standard tape cassette.

Cathode-ray tube: The picture tube of a television set or monitor. It's used to display computer output.

Central processing unit: This is the heart of the computer. It contains the circuits that control the interpretation and execution of instructions.

Computer: An electronic device that can receive and follow instructions and then use these instructions to perform calculations or compile, select or correlate data. The primary differences between a computer and a calculator are that a computer can manipulate text, display graphics and make decisions.

CPU: Central processing unit.

CRT: Cathode-ray tube.

Cursor: The little flashing square or bar on a CRT that indicates where the next character will be displayed.

Data: Any and all items of information—numbers, letters, symbols, facts, statements, etc., which can be processed or generated by computer.

Data base: An entire collection of data in a computer system that can be accessed at one time.

Digital: a system that uses the numbers 0 and 1 to represent variables involved in calculation. This means that information can be represented by a series of bits.

Digital computer: A computer that uses a series of electronic offs and ons to represent informaton. These offs and ons are converted to (or from) binary numbers. Microcomputers are digital computers.

Disk: A flat rotating circular sheet that's used to store bits of information.

Diskette: A flexible disk made of a

Illustrations by Kirk Q. Brown

plastic-like magnetizable material that's either 5¼ or 8 inches in diameter (about the size of a 45 rpm record).

Disk drive: An electromechanical device that stores information on or recalls information from a disk.

Documentation: All of the available information about a particular computer, computer program or set of programs. It should include operating instructions, troubleshooting warnings, labeling, etc.

E

Electronic mail: Personal or other messages generated on a computer and transmitted via phone lines to another computer at a different location.

External memory: mass storage.

F

Floppy disk: A flexible plastic disk coated with magnetic recording material on which computer data may be stored; a diskette.

G

Graphics: The ability of a computer to show pictures, line drawings, special characters, etc., on the CRT or printer.

H

Hard copy: A copy of the computer's output printed on paper.

Hard disk: a rotating mass-storage device that uses a rigid disk made of a hard plastic-like material. It has many times the storage capacity of a diskette.

Hardware: All of the various physical components of a computer system: the computer itself, the printer, the monitor, etc.

High-level language: A computer language that uses simple English words to represent computer commands. For instance, the command RUN in BASIC tells the computer to run a program.

Home computer: Microcomputer.

I

Input: To transfer data from the keyboard, a diskette or a cassette to RAM.

Input/output: The process of entering data into a computer or taking it out.

I/O: Input and output.

K

Keyboard: An input device, usually comprising a standard typewriter-style set of keys and various special keys.

Keypad: An input device, usually consisting of keys for the numbers 0-9 and a period.

Kilo: A prefix meaning 1000. It's abbreviated K, and is overwhelmingly used as a handy approximation of 2^{10}, or 1024.

Kilobyte: 1024 Bytes. Thus 4K of memory is about 4000 bytes of memory. (It's actually 4×2^{10} or 4096 bytes, but 4K is a convenient way to keep track of it.)

L

Language: When used in reference to computers, it means the same thing as human language. The only difference is that a computer language allows humans to communicate with a computer.

Low-level language: A computer language at the machine-language level (a pattern of pure binary coding) or somewhat higher. A low-level language is neither simple nor obvious for a human being to read, understand or use. Compare with *high-level language.*

M

Machine language: The lowest level language. It's a pattern of binary coding that tells the computer what to do.

Mainframe computer: A large, expensive computer generally used for data processing in large corporations, government installations, etc. Originally, the term referred to the extensive array of large rack and panel cabinets that held the extensive bulk of the early computers.

Mass storage: The files of computer data that are stored on media other than the computer's main memory (RAM). Examples are diskettes and cassettes.

Memory: The internal hardware in the computer that stores information for further use.

Microcomputer: A fully operational small computer that uses a microprocessor as its CPU.

Microprocessor: A central processing unit contained on a single chip.

Minicomputer: A small computer based on large-computer technology.

Modem: a *mod*ulating and *dem*odulating device that enables computers to communicate over telephone lines.

Monitor: A television receiver or CRT device used to display computer output.

O

Operating system: A set of computer programs devoted to the operation of the computer itself, which must be present in the computer before applications programs can be loaded or expected to work.

OS: Operating system.

Output: Information or data transferred from the internal memory of the computer to some external device, such as a CRT, a mass-storage device or printer.

P

Packaged software: Canned software.

Pascal: A powerful high-level computer language with modular structure, intended for business and general use. Named for French mathematician and philosopher Blaise Pascal (1623-1662).

Peripheral: Any I/O device, for instance, a printer.

PILOT: This is an easy-to-learn high-level language designed for use by novice computer users. Primarily intended for educational settings.

Printer: A device for producing paper copies *(hard copy)* of the data output by a computer.

Program: An organized group of instructions that tells the computer what to do. The program must be in a language the computer understands.

R

RAM: Random-access memory.

Random-access memory: This is the read-write memory available for use in the computer. Through random access the computer can retrieve or deposit information instantly at any memory address.

Read: The act of taking data from a storage device, such as a diskette, and putting it in computer memory.

Read-only memory: A random-access-memory device that has permanently stored information. The contents of this memory are set during manufacture.

ROM: Read-only memory.

S

Software: The programs and data used to control a computer.

System: All of the various hardware components that make the computer usable—the computer, the printer, modem, disk drive, etc.

T

Terminal: A keyboard and CRT combined in one package, for both input and output. A printer that incorporates a typewriter-style keyboard is also a terminal when used with a computer, or a teleprinter when used or considered by itself.

W

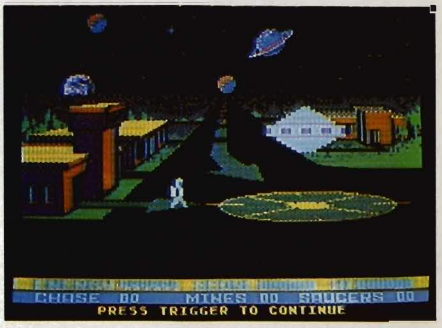
Word processing: A special feature of a computer that allows you to manipulate text. See also *word processor.*

Word processor: A special computer program that helps you manipulate text. You can write a document, insert or change words, paragraphs or pages, and then print the document letter-perfect.

Write: To store data on external media such as disk or cassette. The expression *write to diskette* means that the information stored in the computer's memory is sent to the diskette, where it is stored. ●

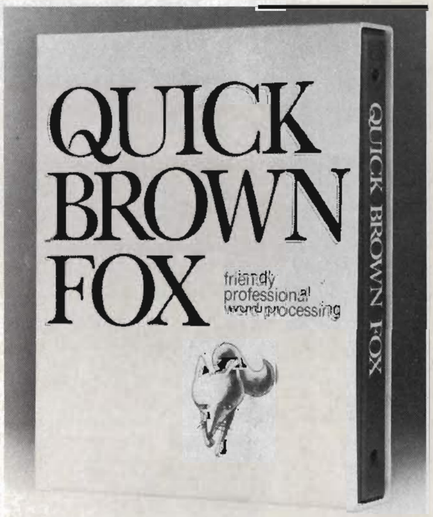
BITS

A STAR IS BORN



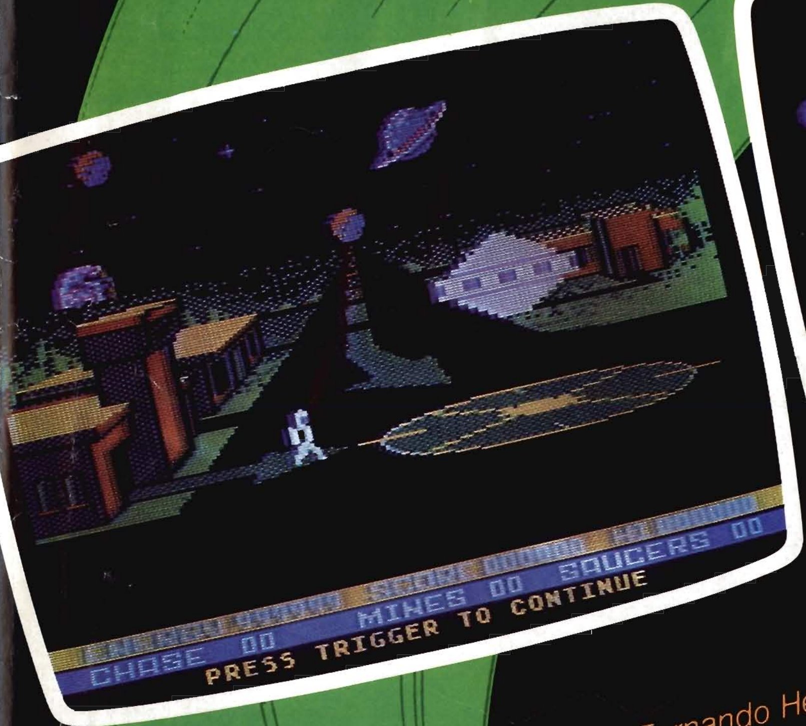
The premiere effort from Fernando Herrera and his newly formed First Star Software (22 East 41st Street, New York, N.Y. 10017, 212-532-4666), *Astro Chase* features vivid arcade-style graphics and sound effects, scrolling screen action and multiple skill levels. For play on the Atari 32K computer system, the game shows why Herrera was one of four programmers to receive Atari's first annual Star Award of Merit in 1981. (About $30.)

A SOFT TOUCH

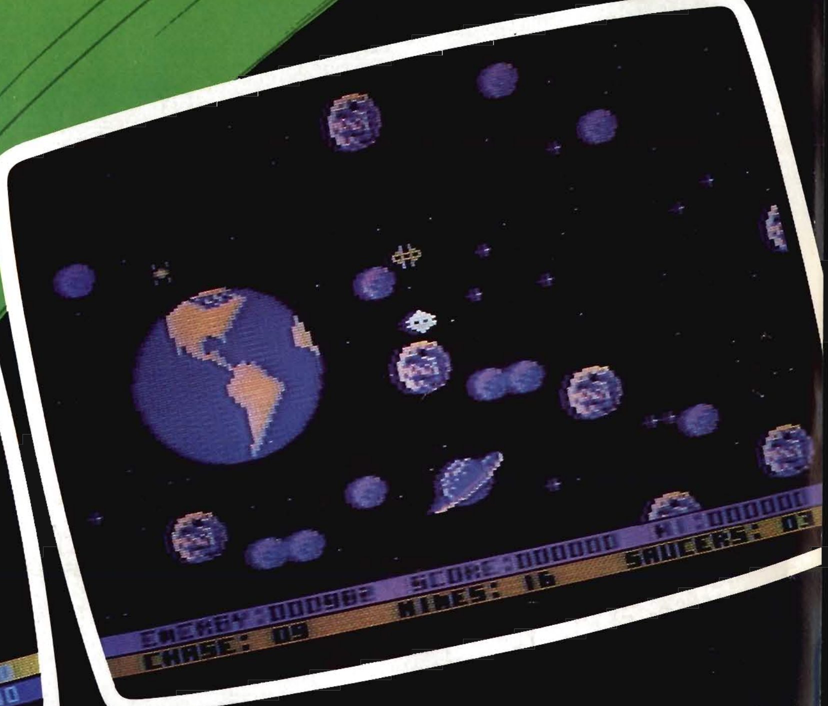


Quick Brown Fox (548 Broadway, Suite 4F, New York, N.Y. 10012, 212-925-8290) brings full-featured word processing in a simple-to-use package for owners of the Commodore 64 and VIC-20. Included is full line and global editing capabilities, tab and margin settings, right justification and proportional spacing. Besides allowing for edited text to be automatically reformated, a special send-and-receive function allows data to be sent from one computer to another. (About $65.) ●

Totally Awesome!



CHASE 00
ENERGY 000000
MINES 00
SCORE 000000
SAUCERS 00
PRESS TRIGGER TO CONTINUE



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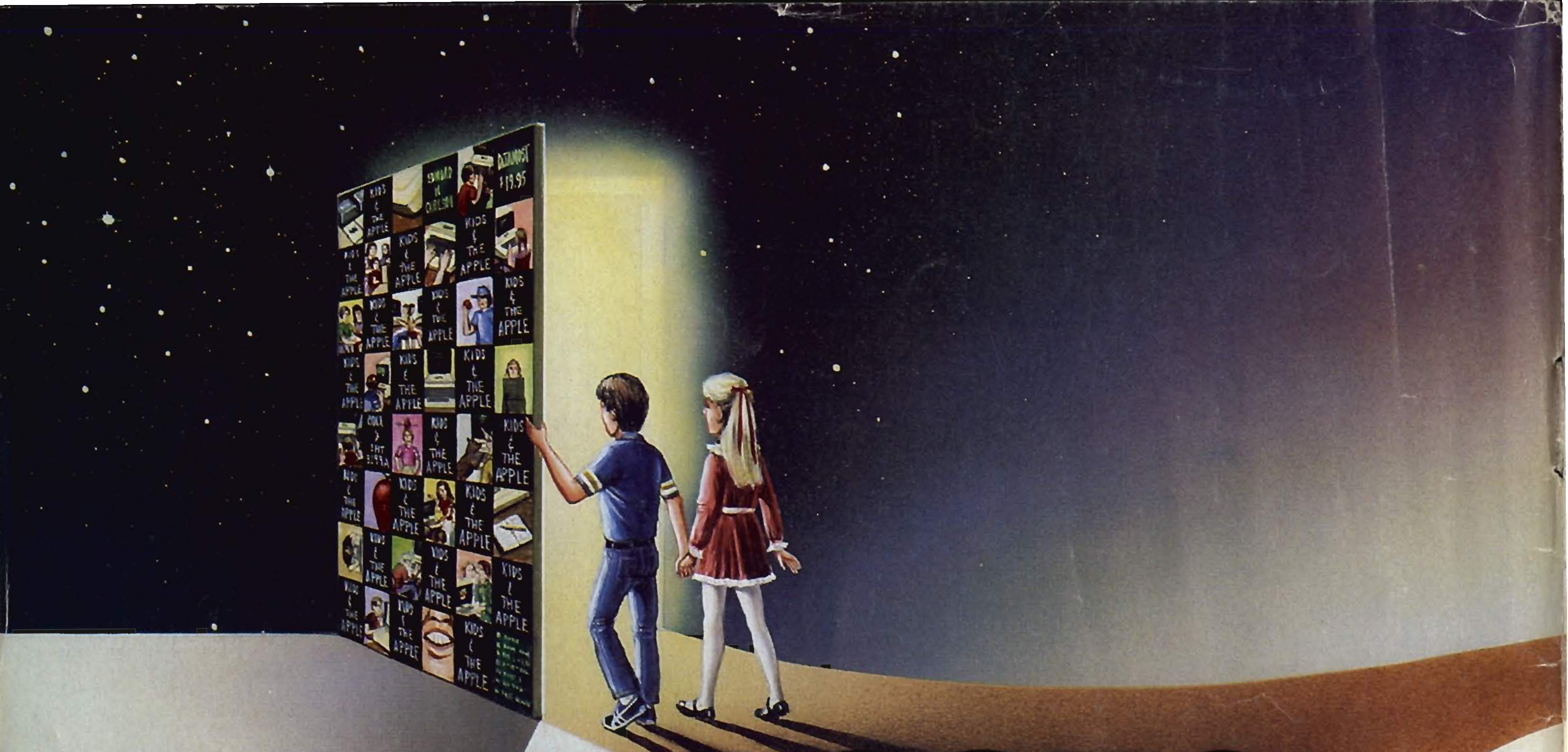

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